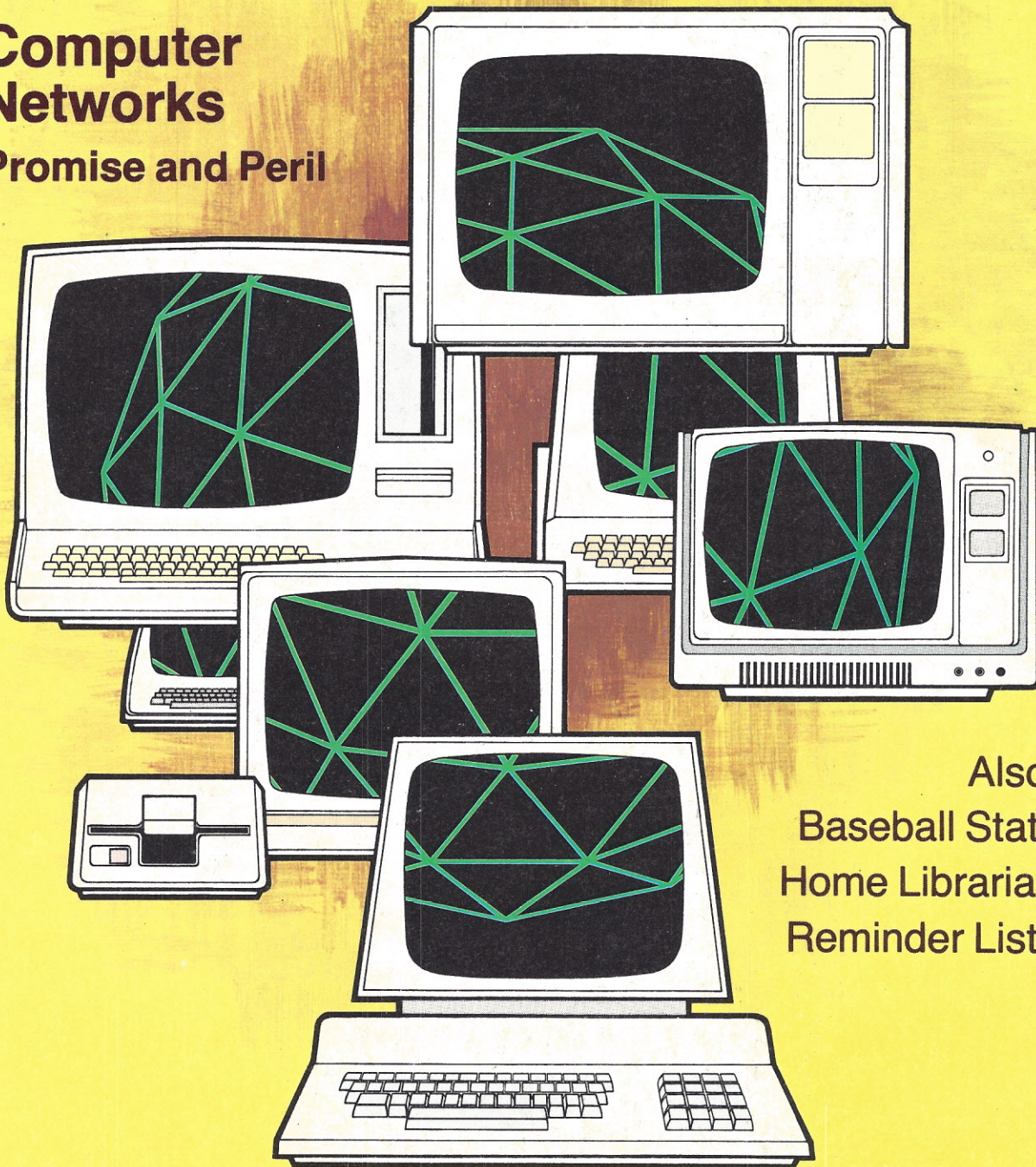


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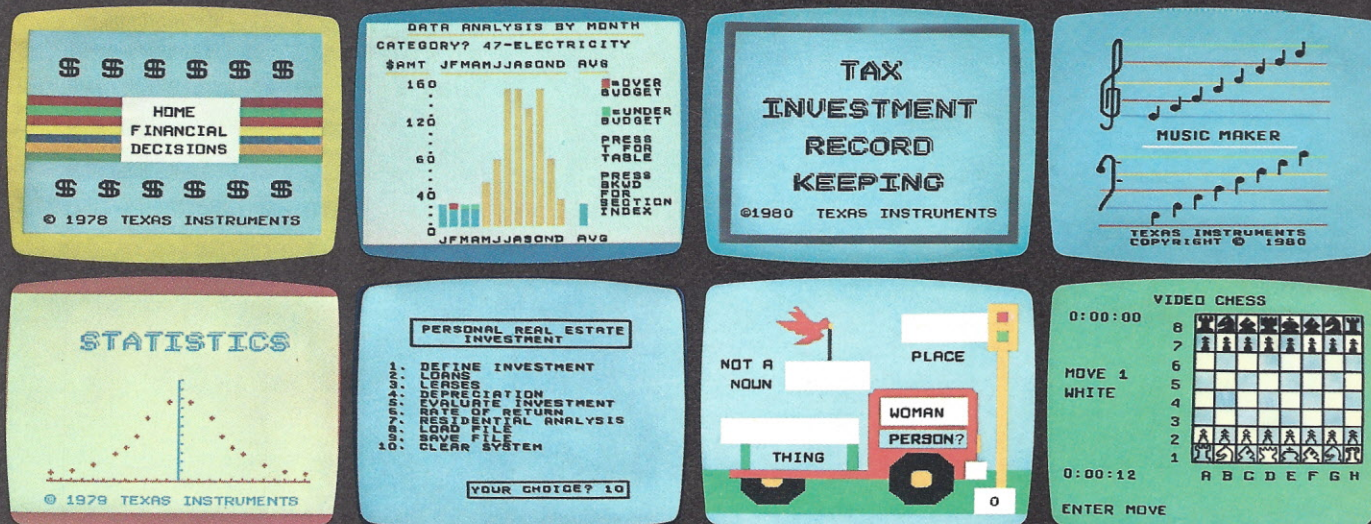
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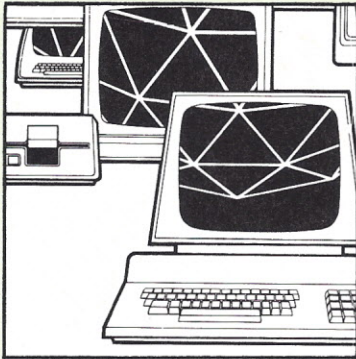
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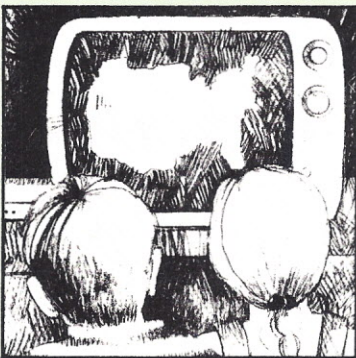
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Personal Computing

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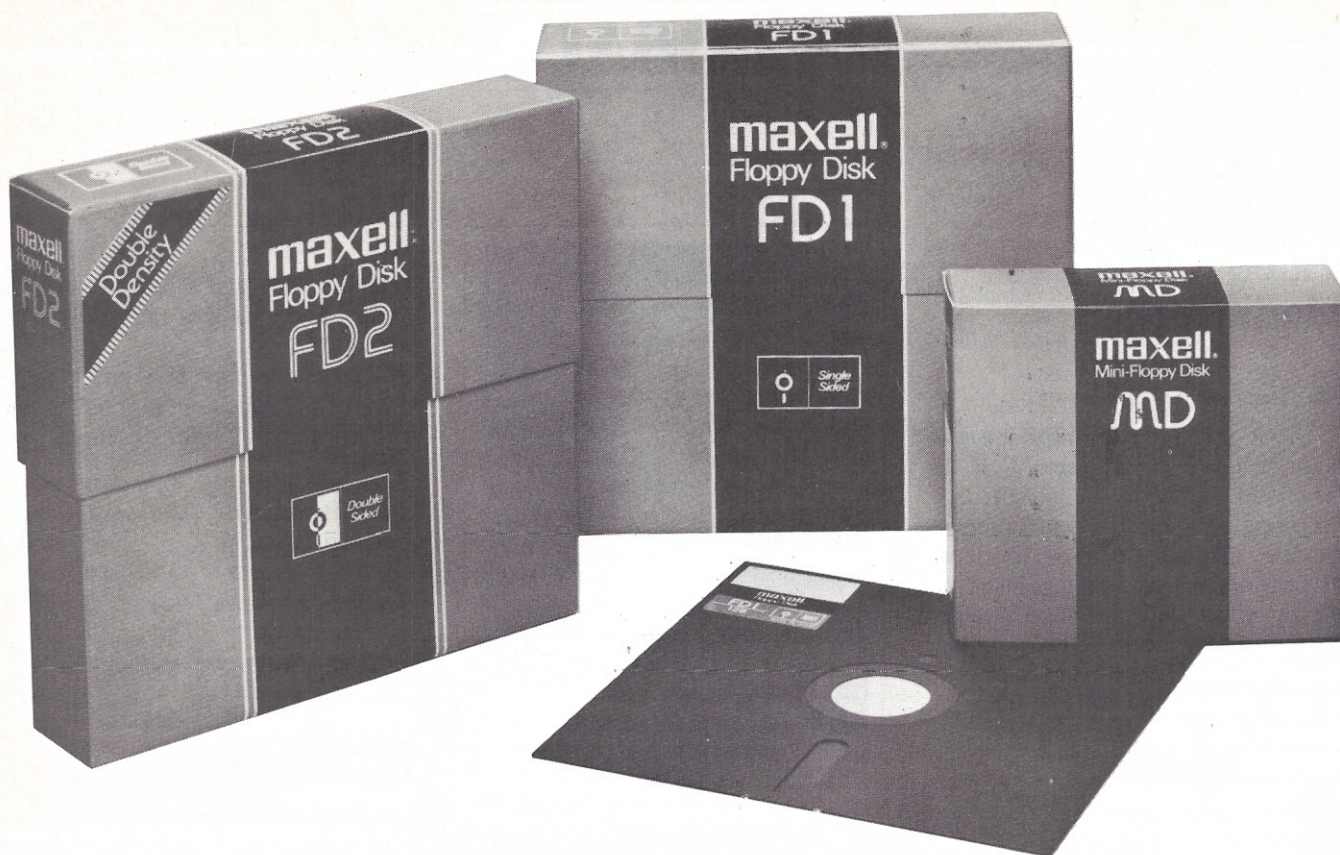
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Publisher. Published monthly by Benwill Publishing Corp.: Harold G. Buchbinder, Chief Executive Officer; George Palken, President; Domenic A. Mucchetti, Treas. Executive; Editorial and Subscription Offices: 1050 Commonwealth Ave., Boston, MA 02215. Controlled Circulation postage paid at Long Prairie, MN.

Subscription rates. U.S.: 1 year (12 issues) \$14; 2 years (24 issues) \$26; 3 years (36 issues) \$38. Canada & Mexico: add \$4/year for surface mail, \$8/year for air-mail. Other countries: add \$8/year for surface mail, \$36/year for airmail. Send subscription orders and address changes to: Circulation, Personal Computing, 1050 Commonwealth Ave., Boston, MA 02215. In Japan/Asia: K. Yanagihara, International Business Corp., 10-10 Shinjuku 3-chome, Shinjuku-ku, Tokyo 160, Japan; (03) 350-0272. In Europe: Personal Computing c/o LP Enterprises, 313 Kinston Road Ilford, Essex, Eng. IG1 1PJ tel: 01 553-1001. **Back Issues.** U.S.: \$3. Canada & Mexico: \$4. All other countries \$6.

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Video Tape Modifications

Dear Editors:

Thank you for publishing my program, "Video Tape Selector," in the July issue.

I hope your readers can appreciate the delay necessary between submitting the program and its ultimate publication. My programming techniques have improved greatly since I submitted it. I would like to offer some minor changes to my program which will conserve memory and make for more efficient operation.

```

5  CLEAR 6000:DIM A$(100,5):I=3:
   J=4:K=5:E$="PRESS ENTER TO
   CONTINUE"
10  CLS:PRINT TAB(25)"VIDEO FILE
   SELECTOR"
15  PRINT STRING$(64,CHR$(134))
   .
   .
90  PRINT E$;:INPUT X
   .
   .
150 PRINT E$;:INPUT X
   .
   .
210 IF Y$=A$(Q,2) GOTO 225
   .
   .
225 GOSUB 140:GOTO 60
   .
   .
230 delete this line

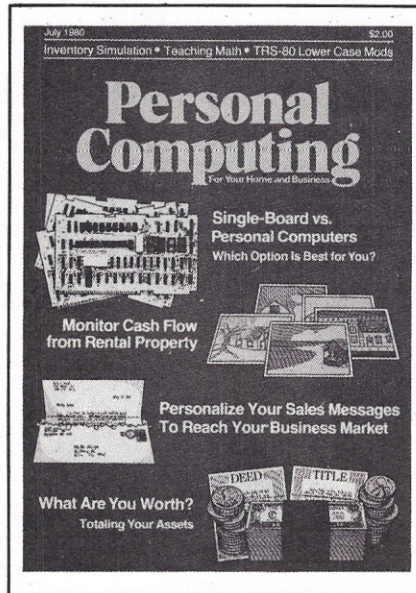
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Robert C. Kyle
Minneapolis, MN

Pet Shifting Point

Dear Editor:

John Nichols' program, "House-breaking Your New Pet" (PC, April 1980) was very nice. However, the article did not mention that once a program has been converted using this shifting program, it can be stored and then reused without using the program again. In other words, this is a tool to



take programs written with the old ROMs and convert them to run with machines using the new ROMs.

My thanks to John Nichols for the program.

Deane Hillsman, M.D.
Sacramento, CA

Successful Bug Extermination

Dear Editor:

Recently I wrote you about the "Check Entry and Retrieval System" program (June, PC) which was giving me a migraine headache.

I want to let you know I have "debugged" the program and it is up and running. I want to commend William Lappen on a well developed program and also you and other *Personal Computing* personnel for running this program in your June issue. The program was very timely as I was just about to begin writing such a program.

I have a TRS-80 Model I with 32K and 2 Percom disk drives. Apparently Mr. Lappen ran this program on a 48K system because I continued to encounter "Out of Memory" and "Out of string space" problems. I changed lines 870 to 1380 in the Summary and Detail program to search the data file for

category info and did away with the array matrix. It is a little slower but works nicely.

Thanks for your help and keep on feeding us readers your good "tidbits and programs." We appreciate your efforts.

D. D. Freeman
Garland, TX

Comments on June Feedback

Dear Editor:

I am relatively new to home computers but I've been programming for 12 years now, including four years study at a university. I was rather disturbed by several things in your June Feedback column, but at the same time I was also heartened by the fact that these amateurs displayed insight into the art of programming that still evades many of the professionals.

Mr. Ruscetta's letter ("For/Next Loops and Faulty Formulas") brings up the issue that Basic is not standardized. It is probably worth pointing out that Basic was never intended to be a programming language so much as a teaching aid to introduce students to computer programming concepts. As such it was not complete and it was not given a proper structure to allow the writing of medium sized or larger programs. I would strongly advise new programmers to try Pascal instead. (Forget about Fortran and Cobol, they are just representative of the industry's failure to learn from past mistakes.)

The specific issue of Mr. Ruscetta's letter was the value of the controlled variable after completion of a FOR...TO loop. Fortran programmers are very familiar with this problem also. Pascal and other Algol type languages eliminate the problem by not allowing the value to be used outside of the loop. This forces the solution Mr. Field suggested in his response (Question: Why not 580 K = N: Q = -1?).

Mr. Keelean's comments regarding the wine tasting program ("Wine Tast-

ing Improved") are excellent. The emphasis on use of arrays should not, as the author points out, be motivated by memory considerations, however. Proper use of arrays makes programs easier to read and modify. As such, array sizes normally should be much larger than the maximum expected amount. Also, when programs are reading values into an array, the array size should be checked to make sure the limits aren't exceeded. Of course, the host should not have been required to count his guests. I suggest the code in Figure 1.

John Montgomery ("Shell Metzner Sort") is to be thanked for: bringing the Shell sort to the readers' attention; the scientific and thorough way in which he tested the sort; and stumbling across the fundamental truth that the best way to achieve improved performance is to select a better method of doing things.

His programs, however, deserve some criticism. AA is dimensioned for

3000 but only 1000 are used. Moreover, 1000 numbers are generated no matter how many are to be sorted. More importantly, the sort routine is only performed once in the program, requiring re-running the program several times. The two main programs are identical, and could have been made into one with two GOSUBs. The sort size more properly should be determined in the main program. Also, loops in a program should be intended to show the structure more easily. The rewrite of the main program suggests itself (see Figure 2).

As Mr. Montgomery's data shows, the Shell sort is faster than the bubble sort. To explain why, you only have to look at the sort method. The bubble sort makes successive passes through the list, comparing adjacent numbers. The first time through it makes $N-1$ comparisons. The second time through it makes $N-2$ comparisons, and so on. As such, it could take $1/2N^2 - N$ compari-

sons. The early exit feature (exit if no exchanges in one pass) adds up to N comparisons in the worst case. It could also save comparisons. On the average it saves $1/2(N/2)^2$ or $1/8N^2$ comparisons. It can be seen that the number of comparisons increases proportional to N^2 . In Mr. Montgomery's data, then, we would expect the sort to take 100 times as long for 100 items as for 10, and the same proportion between 1000 and 100. Putting the times in seconds we get:

10 - 5
100 - 148
1000 - 13924

as we can see, for large N the relation becomes quite exact. For small N , the amount of time setting up the sort becomes significant (adds about 3 seconds).

The mathematics for the Shell sort are more complicated, but it can be shown that the factor of proportionality is about 1.6. That is, sort time increases by $N^{1.6}$. Again, going up by a factor of 10 increases the time by a factor of 40. While the bubble sort takes 10,000 times as long to sort 1000 items as it does 10, the Shell sort only takes 1600 times as long. There are many sorts available faster than the Shell sort, but they usually require extra storage for intermediate results, and only become faster for large N .

One popular sort, which increases according to $\log_2 N$, is the merge/sort. Break the list into $N/2$ sublists of 2 elements each. Sort each sublist. Merge adjacent sublists into $N/4$ sorted lists of 4 elements each. Merge adjacent sublists into $N/8$ sorted lists of 8 elements each, and so on, until you have one list of N sorted elements.

You can modify this to take advantage of any partial sorting already in the list by breaking it down into x many variable length sublists where each sublist is an already ordered sequence found in the original list. For an inverted list this is slightly slower than the basic merge/sort because the mechanics are more complex.

One parting word of advice to home programmers (and professionals too): Keep it simple, straightforward and flexible, and avoid machine dependent features where possible.

Gary Dale
Ontario, Canada

Figure 1

```

80 N=0
81 N=N+1: IF N>12 THEN 90
82 INPUT " ENTER YOUR NAME OR 'END' PLEASE";
   A$(N)
83 IF A$(N)="END" THEN 100 ELSE 81
90 INPUT "GUEST TABLE IS FULL. ARE THERE MORE
   GUESTS?";Y$
91 IF Y$="NO" THEN 100
92 PRINT "A PROGRAMMING CHANGE IS
   REQUIRED."
93 INPUT "DO YOU WISH TO CONTINUE, USING JUST
   12 GUESTS?";Y$
94 IF Y$="NO" THEN 400
99 N=N-1
100 (rest of program same)

```

Figure 2

```

80 INPUT "HOW MANY NUMBERS ARE TO BE SORTED
   (<=3000)";N
81 IF N<0 OR N>3000 THEN goto an error handling routine
82 IF N=0 THEN 170
83 INPUT "WHAT SEED VALUE SHOULD BE USED?";S
84 FOR I=1 TO N: AR(I)=RND(S): NEXT I
85 INPUT "WHAT SORT, BUBBLE=B, SHELL=S";M
86 IF M="B" OR M="S" THEN 88
87 PRINT "ILLEGAL RESPONSE": GOTO 85
88 BEGINS=RIGHT$(TIME$,8)
89 PRINT "SORT BEGAN AT";BEGINS
90 IF M="B" THEN GOSUB bubble sort
91 IF M="S" THEN GOSUB shell sort
92 NDD$=RIGHT$(TIME$,8)
93 PRINT "SORT ENDED AT";NDD$ and so on.

```




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CIRCLE 7

RANDOM ACCESS

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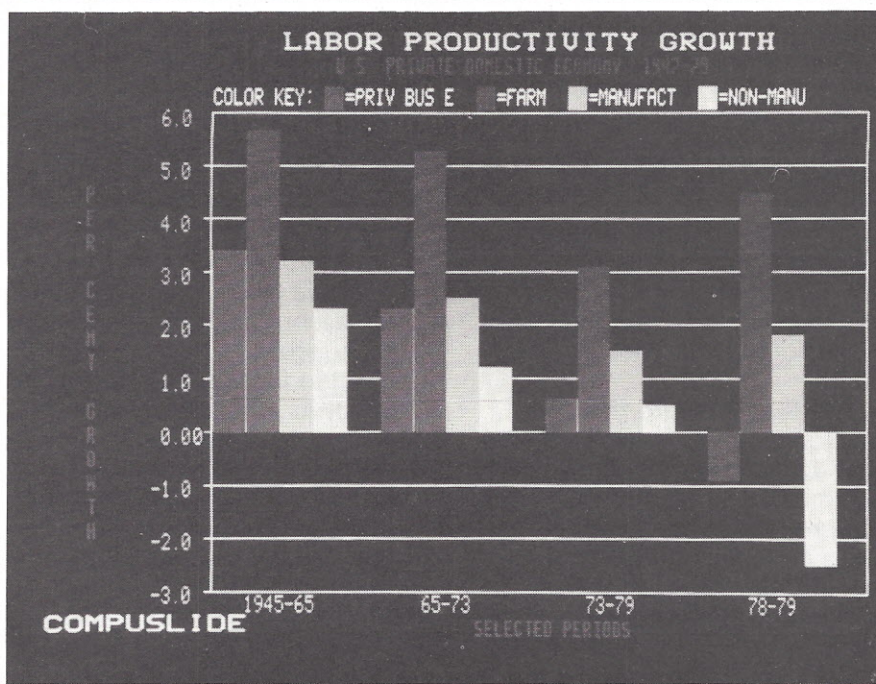
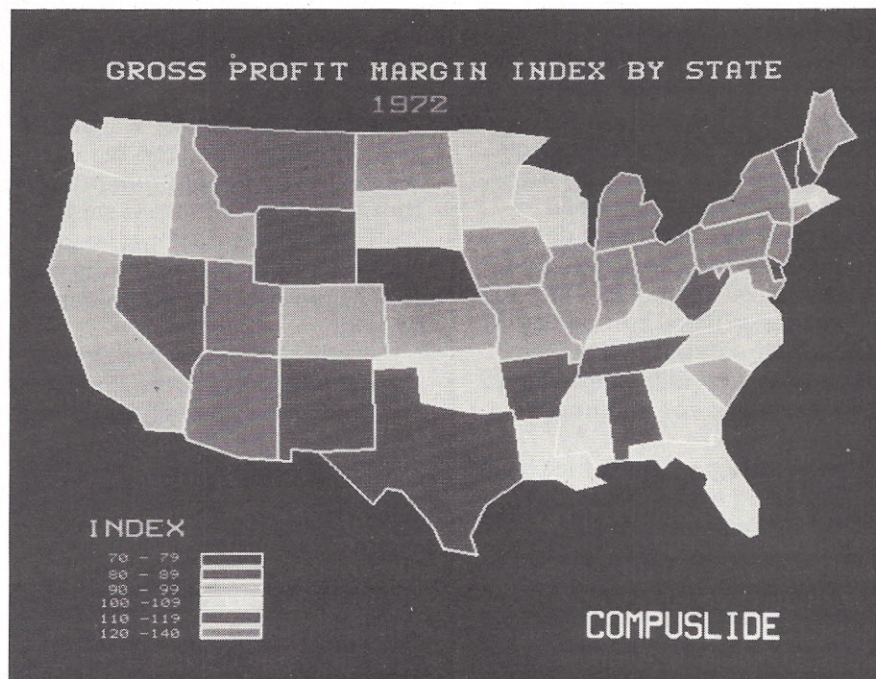
CompuSlide differs from other automated graphics production systems in several major ways, Farina says: It's available at a fraction of the cost — \$1900 per month for the entire system, including computer and camera system (not just a remote terminal). It's simple to use: the artist works by touching with a finger a self-explanatory menu on a screen and sketches with a natural pen-like device, instead of typing in complicated commands requiring weeks of training.

Plus, the CompuSlide system is totally in-house. This avoids the one or two day delay in receiving photographs back from a remote city, and makes the system truly interactive, with immediate feedback on the quality of finished photographs. Being in-house also avoids compromise of proprietary data.

CompuPaint allows artists to "paint" on a computer screen with a variety of colors and "brush" thicknesses and standard geometrical forms (circles, arcs, etc.). After creating a picture with an "electronic brush," the artist

can store it as a symbol in a private symbol library on a floppy disk, and recall it at any time to produce a photographic copy, or as part of another illustration. For example, an artist could draw

an apple, and replicate it on a map to illustrate apple production levels in various states. Or television weather graphics can be created with standard symbols for clouds or lightening which



RANDOM ACCESS

can be called up from computer memory and positioned on the map (using a cursor on a digitizer) in seconds.

CompuFont allows artists to quickly create their own unique serif or sans serif type fonts of

practically any complexity for use in titling. Once created, the fonts can be stored and called up in the future as required.

To create a type font, the artist simply touches a menu on the screen, specifies the size font

desired, defines each letter by indicating boxes to be filled in on a matrix (using the cursor on the digitizer), and stores it away. Artists also have a choice of six standard type fonts supplied with the CompuSlide system.

Expert Helps Companies Choose a Computer

If airlines had been able to match the gains in efficiency and reduced price levels of computers, you could fly from New York to Los Angeles in a half hour for 25 cents.

That is the dramatic example that computer expert Don Simmons uses to tell companies about how far electronic data processing equipment has come in the last 20 years. His Simmons & Associates helps companies decide which computer fits their needs best, and helps design software programs for maximum results.

"A lot of companies that have been sharing time on computers would be better off to put in their own equipment because of the way the price has come down," Simmons said. "The front-end costs will be heavy, but companies can devise their own programs and change them or add to them without having to rely on software packages that might not fit their needs."

However, companies that decide to invest in a computer often get oversold, Simmons believes.

"They aren't knowledgeable about the different models, and they buy more capacity than they need or will need anytime in the foreseeable future," he said.

Another problem first-time buyers of computers may find is that delivery on popular models can take 12 to 14 months. Some brokers, including Simmons & Co., can reduce that time span significantly because of their continuing relationships with the manufacturer, Simmons added.

"If a computer system can

save a company \$100,000 a year — as they often can — then it is important to be able to get the equipment without a long delay," he said.

Once the computer is installed, packaged programs can be plugged in so the equipment performs at once, Simmons said.

"Finding the right package is important, and so is training the staff to operate the equipment," he said.

Simmons thinks companies should have their audit firm audit the computers, though they'll charge extra for that service.

"The chief executive officer should have the auditor's opinion

as to whether the equipment is providing satisfactory data, and whether it is set up to analyze costs effectively," Simmons said.

The Chicago-based Simmons & Associates specializes in working with smaller firms. Sometimes it advises those companies to stick with an upgraded manual system instead of buying a computer.

"Not every company needs a computer," Simmons said.

"Maybe a streamlining of the manual system will be better. We like to start out by helping companies decide if they really need the hardware, before we go on to how it might be used."

Volcanic Ash from Mt. St. Helens Could Cause Disk Damage

Verbatim Corporation has issued a release for those computerists living in areas affected by ash from Mt. St. Helens.

Beyond the problems already caused by Mt. St. Helens' eruptions, layers of volcanic ash now spreading across the nation will leave behind a trail of floppy disks and other computer peripheral media with inaccurate memories, according to a spokesperson from Verbatim Corporation.

"Audio tapes as well as computer disks and tapes will be affected, but the problem is more severe for computer users who count on data accuracy and can lose valuable business information if the media is damaged," according to Bill Clanagan, Verbatim's technical service manager. "The volcanic ash is almost 100 percent pumice-like ab-

rasive material. It will literally polish away the magnetic coating on data media."

If you are in an area where ash has already fallen, Clanagan says the damage has probably already started, and is irreversible. "For example, floppy disks are packaged with liner material designed to pick up dust and debris. When they pick up ash, that material will be retained until damage makes your disks first unreliable, then useless."

There are three defensive measures Verbatim recommends for users of any magnetic media: 1) Back up all valuable data *now*, even before damage becomes evident; 2) Keep disks or other media in boxes with covers or lids; 3) Keep disks (most susceptible to damage) in their protective sleeves and stored upright.

Just a Wave of a Wand

Imagine entering programs into your calculator by merely passing a wand over barcode printed on paper. This quick and accurate method is available with the Optical Wand from Hewlett-Packard.

The wand, which works with the HP-41C, plugs into the calculator and reads HP barcode. Users can easily and inexpensively reproduce and distribute software. Virtually all of the HP-41C's large software library will be available in inexpensive barcode, said HP.

Called the HP-82153A, the Optical Wand is expected to be more convenient than the HP-41C magnetic card reader for users who reproduce and distribute software on a large scale, for those who seldom need to update their software and for users who need to enter pre-defined data from, for example, a table.

The Optical Wand reads programs and data when the user guides it by hand along a line of HP barcode. The wand can read up to 30 inches of HP barcode per second and may be scanned from either left to right or right to left, whichever users prefer.

HP barcode read by the Optical Wand is made up of narrow bars, wide bars and spaces printed on paper, usually black on white. The wand contains a light-emitting diode and a photosensor that detects changes in the light reflected from the sheet being scanned. The detected signal is digitized and translated by two integrated circuits into instructions the HP-41C understands. A push-to-read switch guards against wasted energy and an energy-efficient design lowers power consumption.

When barcode is scanned, the HP-41C emits a scan tone to indicate the last line of program or data was correctly read. An error tone with an error message displayed on the HP-41C, or no tone, means the last line of barcode must be rescanned. The HP-41C display automatically up-



dates itself to indicate the next line to be scanned.

It is also possible to scan a line and have it converted into a binary display on the HP-41C. This feature may be used to assure that the barcode is not faulty and is not being misread.

With the Optical Wand, the user may halt a running program to allow a subroutine in barcode to be scanned and immediately executed or stored until called; and halt a running program to allow a row or many rows of barcode data to be scanned and used by the program.

The specially developed Hewlett-Packard barcode is a simple

form of machine-readable information, yet it offers some of the same features, such as built-in check sums and ability to handle alphanumeric data, as more sophisticated media such as magnetic cards and disks, said HP.

Barcode may be reproduced by many typical office copiers and the copies will be readable by the wand. Thus, barcode is an expensive means of distributing software.

As a service to Optical Wand users, Hewlett-Packard has arranged with an independent printer to produce barcode at a reasonable price. An order form for this service is included with

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each Optical Wand.

Users will be able to get barcode software by sending magnetic card or handwritten versions of their programs to the printer. The independent printer assures that this service, which will be available immediately, will offer excellent quality, inexpensive barcode with a turn-around time of not more than seven days, said HP.

For short programs, all HP-41C and peripheral functions can be executed by scanning a barcode sequence on the Paper Keyboard, which is a sheet of paper with HP barcode versions of the HP-41C keyboard, or on the Barcode Labels included with the Optical Wand.

Entering programs will be less time-consuming and easier with the Paper Keyboard or Barcode Labels than by key entry. Multistep HP-41C instructions may be entered with a single scan.

The Paper Keyboard functions are in the same relative position as on the HP-41C keyboard, so functions are easy to find. The pages peel-off, reusable Barcode Labels come with the Optical Wand. These labels may be arranged by users to create a barcode program for future use.

HP-41C users with a computer and certain models of daisywheel printers, or a plotter or typesetting equipment will be able to generate their own barcode. A manual telling how to configure

systems and listing the necessary Basic and Fortran programs will be available later.

Price of the HP-82153A Optical Wand is \$125 (U.S. price only), which includes the Optical Wand, one Paper Keyboard, 10 pages of Barcode Labels and HP barcode versions of the HP-41C Standard Application Pac programs as well as four demonstration programs. Extra Paper Keyboards and Barcode Labels are available as accessories.

The Optical Wand will be sold through authorized Hewlett-Packard calculator dealers. For information call local HP dealers or (800) 547-3400 (continental United States only). In Oregon call 758-1010.

Fourteen-Year-Old Runs Adventure Game Business

Adventure World of North Chelmsford, MA, is a remarkable company: it offers adventure game software created by a fourteen-year-old on a TRS-80.

Gregory Hassett began programming about three years ago with his father's help. Gregory developed several adventure games and decided to market them. "I'd been looking through some magazines and saw the kind of software being offered; I just decided my adventures were probably good enough to be sold," said Gregory. He was right: he's sold over 1000 cassettes since he began selling them a little more than a year ago.

Gregory says it takes a couple of weeks to develop one of his adventures. Ideas for the games just "pop up." First, he thinks of a title then takes it from there. Each game requires about 250 statements.

When asked if he'd been influenced at all by Scott Adams, the leader in adventure game development, Gregory said he also uses the split screen, as does Adams. "I was almost required to use the split screen when I started programming in machine language."

Adventure World sells eight



games on cassettes. Versions in Basic range from \$9.95 to \$12.95 and those in machine language sell for \$14.95.

Adventures are "Journey to the Center of the Earth," "House of Seven Gables," "Entry in King Tut's Tomb," "Sorcerer's Castle,"

"Voyage to Atlantis," "Enchanted Island Plus," "Mystery Mansion" and "World's Edge."

Gregory plans to attend Phillips Academy in Andover, MA, this fall. Although he won't take his business to school, his parents will handle it for him back at home.

School Software Directory

School MicroWare plans to serve the rapidly growing community of pre-college instructional computer users. *School MicroWare*, from Dresden Associates, Inc., will be a comprehensive and easy to use directory of instructional microcomputer software offered for sale by commercial and other sources, said company officials.

Although this may surprise many readers, hundreds of instructional software products are currently being offered by suppliers all over the world, said Dresden officials. This fact is not well understood because it has been very difficult to find out about what is being offered. Very few computer stores carry a representative selection of instructional software products, continued a company spokesperson. There are many ads in the journals, but teachers rarely have time to keep up with these. What educators need is a convenient reference source which brings together in one place information

about all available software; *School MicroWare* hopes to provide that source.

The first edition of *School MicroWare* is scheduled for late September, 1980. Quarterly updates will be published in December, February and April. A regular subscription will be \$20 per volume including the current directory and three updates. A special introductory offer provides subscriptions at a reduced rate of \$15 until November 15, 1980. Quantity discounts are available.

The first edition of *School MicroWare* will feature over 500 instructional programs and packages. Most school departments will be represented. It will include software for the three micros most widely used in education: the TRS-80, PET and Apple II.

School MicroWare is designed to be of maximum utility to the educator in search of software for use in the classroom. The

main section of the directory will include four-line items for all products. This section will be organized by major discipline and within that by subject area. Each item will include program name, subject, grade level range, program type (simulation, etc.) and functional description. It also will identify the hardware on which the software operates, the programming language, the suppliers and the retail price. Other sections will list vendor information and all products by hardware system.

School MicroWare is being published *for educators by educators*. Dresden Associates is a consulting firm specializing in instructional computing applications and information systems. Staff members have experience in the instructional computing field; they understand school needs and are producing a publication designed to meet those needs.

Subscriptions to the directory are available from Dresden Associates, P.O. Box 246, Dresden, ME 04342.

☆☆☆ Announcements ☆☆☆

Small Business Conference

Three regional computer conferences will be held on the theme "Thinking Small - Using Small Computers to Increase Business Productivity." The dates and locations of these programs are: September 18 to 21 - Washington, D.C.; October 16 to 19 - Chicago, IL; November 20 to 23 - Boston, MA.

These conferences will be sponsored by The Information Exchange, a non-profit independent organization dedicated to innovative programs for dissemination of information to the technological, business and managerial communities. Each conference program will bring together leading authorities and current small

business computer users in a four day program designed to explore the opportunities presented by small computers for productivity improvement of the small business.

Among the conference speakers are Lewis Kornfeld, President, Radio Shack, who as the keynote speaker, will discuss "Computerize or Fall Behind: The Small Computer Does Make a Difference." Fran Abernathy will make a "Special Report from the White House Conference on Small Business - Issues Effecting Computer Use in Small Business."

M.E. Sandfelder of IBM will talk about "The Advantages of Automation for Small Business." S.R. Senkus, also of IBM, will present "The User's Role During Computer Implementation." A

special session on "The Automated Office for the Small Business: When Can It Be Justified?" will be led by Gerald Mendenhall, Partner, Arthur Young & Company.

For further details contact Kendall Burroughs, The Information Exchange, 1730 North Lynn Street, Suite 400, Arlington, VA 22209; (703) 521-6209.

Lifelines

Lifelines is a monthly newsletter designed for those who take computers and computer software seriously. The primary objective of *Lifelines* is to give software owners full after-sale service by keeping readers informed on the current status of software prod-

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ucts. Each month there is a table listing the array of serious CP/M compatible software products distributed by Lifeboat Associates. Readers will be notified of new versions, new products, discovered bugs and bug fixes. Articles dealing with the relative merits of alternative software products will be featured.

Lifelines also acts as a forum for software users. Subscribers can give effective feedback to authors and distributors and share experiences and concerns.

The monthly also serves as the official newsletter of the CP/M Users Group (CPMUG). One section is devoted to the distribution of users groups' news; catalogs and abstracts of new CPMUG volumes will be published.

The introductory price is \$18 for twelve issues postpaid (U.S., Canada, Mexico), \$40 postpaid elsewhere. Single copies are \$2.50 each. Please send prepaid orders to *Lifelines*, 1651 Third Avenue, New York, NY 10028. Master Charge and VISA accepted.

Houston 80 Users

The 80-Users of Houston club meets the first Wednesday of each month at 7:30 PM. Anyone interested in microcomputers for personal or business use is welcome. For meeting location contact Ben Taylor at (713) 664-5823; 3723 Purdue, Houston, TX 77005.

New Jersey Show

The New Jersey Personal Computer Show and Fleamarket will be held on September 27 and 28 at the Holiday Inn (North) Convention Center at Newark International Airport. There will be user forums, an outdoor flea-market and free parking. For more information contact NJ Personal Computer Show, Kengore Corporation, 9 James Ave., Kendall Park, NJ 08824; (201) 297-6918 after 7PM EST.

Z-Users Group

The Z-USERS GROUP is devoted to the Pascal/Z compiler, Z80 software, and Z8000 software. The group hopes to assist the public in using, improving and exchanging information (software) pertaining to the Pascal/Z compiler, Z80 and Z8000. A flyer will be issued bimonthly with Bug notes, fixes and other information. There is a cost of \$6 to get on the mailing list. Public domain programs will be distributed. The group will offer a disk full of software, runnable under CP/M, single-sided/single-density. The first volume is due for distribution July 1, 1980, at a cost of \$10. For more information contact Z-Users Group, 7962 Center Pkwy., Sacramento, CA 95823.

Software Directory

Anyone who needs computer software can now post a notice in the "Software Wanted" section of the Computer Consultant newsletter/directory. There are no restrictions on the requirements listed; the software desired can be for an individual or organization's own use or for resale. At present, no charge for this service is planned.

The Computer Consultant is a bimonthly national directory of consultants, organized by specialty, in various computer related areas. Articles of interest to consultants are also included. For more information contact Battery Lane Publications, P.O. Box 30214, Bethesda, MD 20014.

TRS-80 Sweepstakes

V R Data is celebrating its eighth anniversary with a TRS-80 Sweepstakes. Over \$1700 in prizes will be awarded by random drawing. Grand prize is a 16K Level II TRS-80 System. Two second prizes consisting of a 5-1/4" disk drive and four third prize \$50 gift certificates will also be awarded. To enter, mail

name and complete address to V R Data, 777 Henderson Blvd., N-6, Folcroft Industrial Park, Folcroft, PA 19032, or call 1-800-345-8102 for information. Entries must be received by October 31, 1980.

Teacher's Newsletter

Teaching Computer Programming is a newsletter directed at instructors teaching computer programming at the high school or junior high school level. There are specific articles for the Apple II and TRS-80, but whenever possible, the articles will be applicable to any microcomputer, said newsletter organizer Craig Nansen.

Articles consist of sample programs, programming techniques, methods of explaining programming concepts, sample quizzes and tests and problems for assignments.

For more information contact Craig Nansen at 1112 Glacial Drive, Minot, ND 58701.

Office Equipment Expos

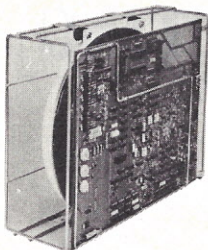
Computerized Office Equipment Expo — Midwest (COEE) has been scheduled again for April 7 to 9, 1981, at the O'Hare Exposition Center, Rosemont, IL.

The Third Annual Computerized Office Equipment Expo-Southwest (COEE) is scheduled for October 29 to 31, 1980 at the Astrohall in Houston, TX.

The shows will emphasize the latest techniques of integrating equipment for data and word processing, copying/duplicating, micrographics and telecommunications into complete business systems to provide more efficient business operations, said a show spokesperson.

An exhibition of business products, equipment and services will be presented along with the seminars. For more information on the shows contact Industrial and Scientific Conference Management, Inc., 222 West Adams Street, Chicago, IL 60606; (312) 263-4866.

PRIAM Hard Disks Now Available from SIRIUS SYSTEMS!



PRIAM's high-performance, low-cost Winchester disc drives speed up throughput and expand data storage from 20 megabytes to 154 megabytes. And a single controller can be used to operate 14-inch-disc drives with capacities of 33, 66, or 154 megabytes or floppy-disc-size drives holding 20 and 34 megabytes. So it's easy to move up in capacity, or reduce package size, without changing important system elements or performance.

- Fast, Linear Voice Coil Positioning
- 10 ms track-to-track positioning
- Fully servoed head positioning
- Dedicated servo tracks
- DC Power required only!
- Simple, parallel Interface
- Optional SMD Interface
- 50 ms Average Positioning time
- 90 ms Maximum Positioning Time
- 6.4 ms Average Latency

THE PRIAM LINEUP

Model/Disk Size	Capacity	Size	Weight	Price
DISKOS 3350 (14")	33Mbytes	7" x 17" x 20"	33 lbs.	\$2995
DISKOS 6650 (14")	66 Mbytes	7" x 17" x 20"	33 lbs.	\$3749
DISKOS 15450 (14")	154 Mbytes	7" x 17" x 20"	33 lbs.	\$4695
DISKOS 2050 (8")	20 Mbytes	4.62" x 8.55" x 14.25"	20 lbs.	\$2995
DISKOS 3450 (8")	34 Mbytes	4.62" x 8.55" x 14.25"	20 lbs.	\$3745
DISKOS 570	5.3 Mbytes	floppy-size	(low)	(low)
DISKOS 1070	10.6 Mbytes	floppy-size	(low)	(low)

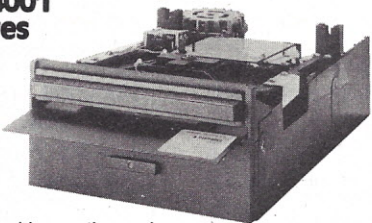
All PRIAM DISK Drives have a Transfer Rate of 1.03 Mbytes/Sec.
Optional SMD interface available for \$150.

SIRIUS SYSTEMS offer cases and enclosures for all PRIAM Hard Disk Drives. All 14" Winchester Drives will mount in our 14" Standard Case. The 8" Winchester have two alternatives: a single drive case and a dual drive case. All SIRIUS SYSTEMS Winchester drive cases include Power Supply, internal cabling, switches, fan, extra AC outlet (not switched, but fused) and possess very adequate ventilation. Drive addressing is done on the rear of the Case and not on the drive itself to provide ease of use during operation. All WINCHESTER DRIVE Cases are Warranted for a full year and come in our standard blue-black color scheme. Consult us for current availability and pricing.

Remex RFD 4000/4001 8" Floppy Disc Drives Double sided ... Double density!!

\$549⁹⁵

RFD 4001, \$569.95



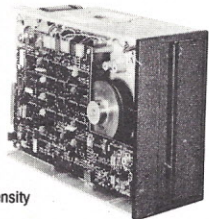
Offers quality and features found in drives costing much more! ■ Single or Double Density ■ Double-Sided Drive ■ Door Lock INCLUDED ■ Write-Protect INCLUDED ■ 180 Day Warranty ■ Compatible with Shugart 850/851 ■ Low Power Operation ensures LONGER LIFE!! ■ Model RFD 4001 offers Data and Sector Separator

RFD 4000/4001 Technical Manual	6.95	RFD 4000C/B Cabinet (for use with	
Connector Set #3 (AC, DC, Card Edge)	10.95	Power Modules)	29.95
Connector Set #4 (AC and DC)	2.95		

Remex 1000B ... If you've been looking for a less expensive floppy disc drive, but not wanting to sacrifice quality — this is it!

\$419⁹⁵

You get both in the Remex 1000B! For only \$419.95 look at what you get: ■ 8" Floppy Drive ■ Single or Double Density ■ Hard or Soft Sectoring ■ Media Protection Feature ■ Single Density Data Separator ■ 180 Day Factory Warranty



Door Lock Option	\$19.95	Write Protect Option	\$19.95	RFD 1000B Technical Manual	\$5.95
Interface Adapter		Connector Set #1		RFD 1000B CASE (for use	
(REMEX-to-Shugart)	\$14.95	(AC, DC, & Card Edge)	\$10.95	(with Power Modules)	\$29.95

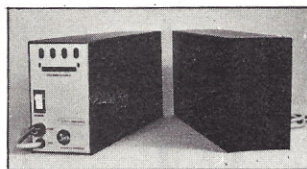
SIRIUS 8" DISK POWER MODULES

The Single and Dual Drive Power Modules are designed to provide DC and (switched) AC power for one (the Single Drive Power Module) or two (the Dual Drive Power Module—the DDPM) will power three RFD 4000s or 4001s) 8" Floppy Disk Drives. Many features are included for safe and reliable operation and the Power Modules come with our stan-

dard 180 day WARRANTY (the Open Frame Power Supply warranty is for 2 years). All Power Modules will work with either the RFD 4000C/B or RFD 1000B case (color schemes match also).

Dual Drive Power Module (DDPM)	\$139.95
Single Drive Power Module (SDPM)	119.95

SIRIUS 80+ Perfect Add-Ons for Your Computer System!



The SIRIUS SYSTEMS 80+ Series of Floppy Disk add-ons are designed to provide unmatched versatility and performance for your computer. Consisting of four different add-ons, there is a 80+ Series Floppy Disk to meet your need. All 80+ Series Floppy Disk are compatible with the TRS-80+ and come ready to plug in!

COMMON CHARACTERISTICS

- 5 ms track-to-track access time
- Auto-eject
- 180 day WARRANTY
- Exceptional speed stability — 1 1/2%
- Single density (FM) or double density (MFM/MFM)
- Ultra high reliability
- 2 year Power Supply Warranty
- Mix any or all 80+ Series on the same cable!
- Includes user accessible plugboard for drive reconfiguring

SPECIFIC CHARACTERISTICS

The SIRIUS 80+1 is a single sided, 40 track, highly reliable Floppy Disk add-on. Offering 5 more tracks than the Radio Shack model, it cost \$140 less! Formatted data storage is 102K/20K bytes single/double density.

SIRIUS 80+1 \$359.95

The SIRIUS 80+2 is a dual sided, 70 track (35 per side), highly versatile Floppy Disk unit. It appears to the TRS-80+ as TWO 35 track drives, yet COST LESS THAN HALF THE PRICE! Even greater savings result, since data is recorded on both sides of the media instead of only a single side. Using the plug board, it may be reconfigured for other computer systems! (The 80+2 operates as Drive 0 and any of the other three addresses (with the standard Radio Shack Cable) or as any of four drives (with the SS Standard Cable).) Formatted data storage is 80.6K/161.2K bytes single/double density.

SIRIUS 80+2 \$449.95

The SIRIUS 80+3 is a single sided, 80 track, "Quad" density Floppy Disk unit. Offering 2 1/2 times the storage of a Standard Radio Shack drive, the 80+3 greatly reduces the need for diskettes correspondingly. Additionally, because of the increased storage and faster track-to-track access time, the 80+3 allows tremendously increased throughput for disk based programs!!! The 80+3 INCLUDES SIRIUS's TRAKS-PATCH on Diskette. Formatted data storage is 204K/40K8 bytes single/double density.

SIRIUS 80+3 \$489.95

The SIRIUS 80+4 Floppy Disk add-on is a double sided, 160 track (80 per side), 5 1/4" monster! The ultimate in state-of-the-art 5 1/4" Floppy Disk technology, to 80+4 is seen by the TRS-80+ as two single sided disk drives, each with 80 tracks. Thus, in terms of capacity one 80+4 is equivalent to 4% standard Radio Shack drives — a savings of over 73% (not to mention diskettes!!!). (With a double density converter, the available memory is huge!) The 80+4 is similar to the 80+2 in that it arrives configured as Drive 0 and any of the other three addresses (with the standard Radio Shack Cable) or as any of four drives (with the SS Standard Cable). The 80+4 INCLUDES TRAKS-PATCH on Diskette. (The plug board is also included.) Formatted data storage is 408K single density or 816K bytes double density.

SIRIUS 80+4 \$624.95

All 80+ Series Floppy Disk add-ons operate a 5 milliseconds track-to-track access time (eight times faster than the SA 400) but are Expansion Interface Limited to 12 milli-seconds for the TRS-80+.

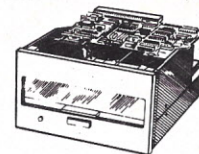
*TRS-80© Tandy Corp.

MPI 51/52 ... A Great Reliable Mini-Drive!

- Fast! 5ms track to track access
- Exclusive Pulley-Band Design
- Unique Door/Ejector Mechanism
- Reliable 1 1/2% Speed Stability
- Single/Double Density Operation
- Industry/ANSI Standard Interface

MPI 51
(Single Head, 40 tracks, 120K/240K bytes Single/Double Density**) \$259.95

MPI 52
(Dual Head, 70 tracks, (35/side), 218.8K/437.5K Single/Double Density**) \$349.95



MPI 91/92 ... NEW STATE-OF-THE-ART DISK DRIVE!

MPI 91
(Single Head, 80 tracks, 240K/480K Single/Double Density**) \$389.95

MPI 92
(Single Head, 160 tracks (80/side), 480K/960K Single/Double Density**) \$499.95

**Unformatted data storage

Introducing the Versatile, Low-Cost OMEGA Series Controller

As new technological advances bring down the cost of fast, reliable mass data storage, the need for an inexpensive, versatile controller have become greater and greater. To meet this need, SIRIUS SYSTEMS' OMEGA Series Controller was designed.

The SIRIUS OMEGA Series Controller Module utilizes an on-board microprocessor to mediate data transfer to a wide variety of peripherals from an equally wide variety of host computer systems. Up to four Winchester Hard Disks (8" or 14"), four 5 1/4" Floppy Disk Drives and/or up to eight 8" Floppy Disk Drives may be in use at one time. Host systems interfacing is accomplished via a parallel or a serial interface. With the addition of a Personality module, the OMEGA Series Controller Module is directly compatible with many popular computer systems (among them the TRS-80*, Apple, Heath, and others). Provision is made for the addition of a streaming tape drive, also.

SPECIFIC HARDWARE FEATURES INCLUDE:

- Control of up to twelve Floppy Disk Drives (eight 8" and/or four 5 1/4")
- 8" and/or 5 1/4" Disk Drive Utilization
- Single (FM) or Double (MFM) density data storage
- Hard or Soft sector diskette usage
- Utilization of "Quad" density (96 tpi) 8" or 5 1/4" Disk Drives
- Control of up to four WINCHESTER type PRIAM DISKOS Disk Drives
- 8" or 14" may intermix on the same cable
- Accommodates 8" and/or 14" drives of 5.3Mbytes to 154Mbytes
- Ultra-Fast data transfers
- Extremely flexible host-controller interfacing

SPECIFIC SOFTWARE FEATURES INCLUDE:

- Dynamic format modifications via command words
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Psychology, Education and Computers

—BY WILLIAM R. PARKS—

If computers can be programmed to think like you and me, then it seems that modern technology should greatly affect the way we think about ourselves. The study of psychology will be greatly stimulated by the thoughts or thinking carried out by human programmers using thinking machines. There is a saying — “You are what you think!” If human thoughts can now be entered into machines, it should only be a matter of time until disciplines such as psychology, anthropology, education and so forth, which center on man and his thinking activities, will start investigating, in an objective way, the nature of man in the computing sciences.

Here is a hypothetical (and humorous) situation that might happen in the future. An anthropologist takes a portable desk-top home computer (that perhaps runs on solar batteries) to a primitive tribe in some distant jungle or island. He introduces this tribe to the home computer — games, programming and educational uses. He even teaches them to make minor repairs, then leaves and promises to return.

Unknown to this tribe is the existence of a miniature radio transmitter located somewhere in the computer.



Professor Parks is in the Department of Mathematics and Computer Science at Fredonia State University College, Fredonia, NY.

The anthropologist might place a “repeater” type transmitter on some nearby hill or mountain to collect all data and relay it to his office receiving device (perhaps via satellite/teleprocessing means).

The system used by the anthropologist might utilize another computer to constantly monitor the tribe’s computer use. Which games do they play the most? What kind of applications do they invent for computer processing? What kind of programs are coded? Perhaps a questionnaire generating program regularly asks members of the tribe for responses.

The above idea may seem far fetched, but isn’t it true that there are already organizations in our country which monitor a sample of households (about 1500 at a time) concerning their TV-viewing habits? Nielsen ratings are based on these monitorings. Other agencies study the effects of different styles or presentation of TV ads on viewers. The pupils of the eyes are even photographed for size during trial experiments. The outcome of such daily experiments determine whether certain shows will be renewed for another season or discontinued.

In my example there are many questions to consider. How could you train primitive people to program? What would be so primitive about a tribe that owned a computer and used it on a daily basis? This story was meant to illustrate a point. Perhaps a thousand years from now our computer technology will be viewed as primitive. Anthropologists in the future could study our culture from a computing point of view and determine what was on our minds since our thoughts are now recorded in computer programs.

I think our present computer technology is preoccupied with computational thinking. An anthropologist studying our programs, which he might survey at random, would mostly find operations of arithmetic. As computer

usage becomes more sophisticated, the anthropologist would discover more code of a logical decision-making nature.

Of course we are already doing this type of thing; however, in the future, artificial intelligence will generate human-like robots with creative personalities. Will psychologists and anthropologists use the tools of their trade to analyze these humanoid robots? Is it ridiculous to state, “In the future the personalities of computers will have to undergo thorough psychoanalysis by competent psychologists?” I don’t think so because I have already seen want ads for such people. One major corporation has made a major research commitment to study “human factors” in man-computer dialogue sessions. They even advertised for psychologists with computer backgrounds to work on the project.

Of course I don’t want to get too carried away by such topics as the psychology of man-machine dialogue, but maybe some programmers should consult a psychiatrist for help in programming projects that call for man-machine interactions. Maybe psychiatrists should prepare themselves by studying computer science to effectively answer questions about the psychology of computing and programming. I said in a past column that some complicated programs have latent personalities in their code which emerge when the program is executing. If this is true, then psychiatrists must get involved because personalities are their main area of study — why not computer personalities as well?

In education the importance of human factors becomes evident. What is the best method to transmit knowledge by computer? I can see a whole new field developing, a tremendous area for research by doctoral students in graduate programs. Many dissertations could be written on the effect of one programming methodology over an-

other in the man-machine dialogue during educational programming.

When I was in graduate school, I was fortunate enough to study the psychology of learning. Human learning processes are very complex activities. Computers and programs that are supposed to teach humans need to be analyzed for effectiveness and speed of learning. Also, artistic and graphical concepts will need to be increasingly applied to educational programming. Animation and response by users will no doubt add fun to learning via computer. Perhaps in the future most learning will take place in the home. Theories of software development need to be introduced in the educational curricula at teacher education colleges. I believe that because of the invention of the low-cost microcomputer education will never be the same. The education of Americans, from this point in our history, will include stored programs in home computers. It is time for professional educators to get deeply involved in the act. Microcomputers will go down in the history of education as more significant than any single technological means of educating, surpassing even television. With the right kind of animated software, a microcomputer system is a higher form of television. It is "intelligent television."

What's the difference between intelligent television and regular television? In regular television the viewer is passive, but with intelligent television, (animated software run on microcomputers), you can expect intelligent responses from the viewer/user of the programmed software. A dramatic presentation or a simple cartoon can be programmed to have different endings based on the responses of the user.

What an interesting media event it would be if 50 million Americans watched intelligent television and collectively ruled the outcome and/or sequences of events in a dramatic presentation. This could be one result of interactive intelligent television based on the microprocessing technology of today. We have the technical means to do it. It is only a matter of time before such media events become commonplace.

Many fields or disciplines will have

to get involved with computing, fields which you might not expect to be part of the computing industry. Psychologists, educators, artists, graphic designers, learning theorists and many other professionals will get involved in the task of programming. In the past

computing was too expensive and was mostly left to programmers. Now that computing power can be carried around in a briefcase at low cost and hooked up to the home television or telephone, this power can become a common everyday experience for everyone.



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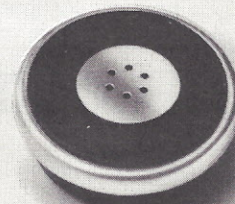
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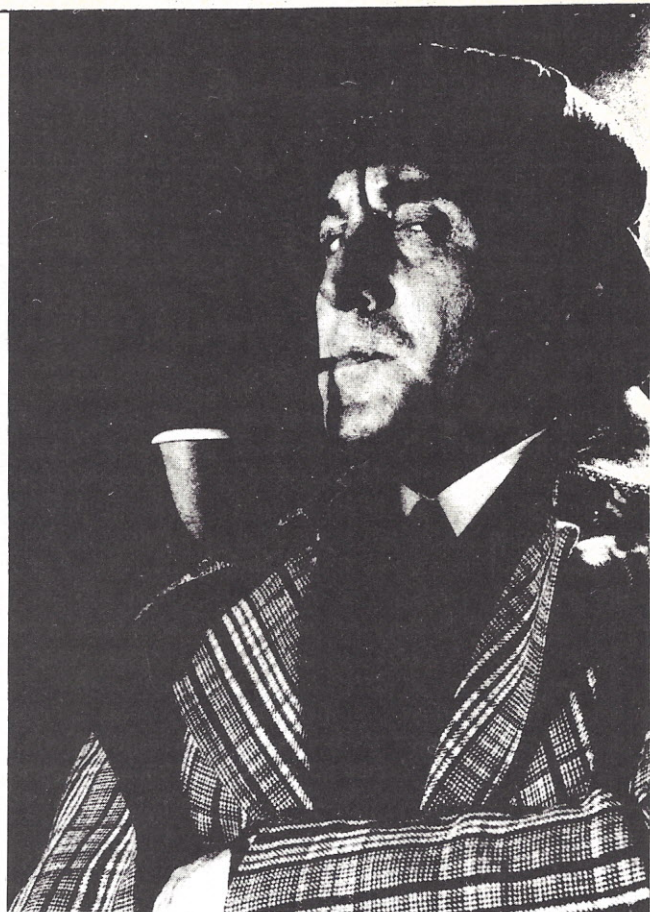
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Baseball Statistics

BY KEVIN WILLIAMS



Keeping accurate statistics is almost as important to sports as the players themselves. Football players are judged by their yardage gained or tackles made, and baseball players are rated by their batting average or their earned run average.

There's a lot more to a baseball statistician's job than just figuring out batting averages. For complete information on a given team, you need over 40 different statistics. These five programs, CREATE, CHANGE, ENTER, CORREC and PRINT, allow you to keep a record of 22 fielding and 22 pitching statistics. Anyone from a fan keeping track of a favorite team to a varsity baseball coach can have a record of the team's achievements quickly and easily.

I originally began writing these programs when a high school math teacher (an avid baseball fan) asked me if I would work on a program to allow him to keep track of the statistics for a hobby of his, Strat-o-Matic baseball. In Strat-o-Matic baseball, the participant is the manager of his own baseball team, based on actual performances of present professional baseball players. Each league consists of about 10 teams which play full 162 game schedules. Trying to keep track of all the necessary statistics soon became a long and tedious job.

These programs were written on a PDP-11/45 in Digital Equipment Corporation's Basic-Plus. The longest of the five programs is 10K bytes, and the amount of variable storage needed for rosters and statistics is around 19K. A micro-computer with 32K RAM and one disk drive will easily handle the set of programs.

There is only one function I used that is unique to the PDP-11 — virtual memory arrays. Because of core limitations on the time-sharing system, I found that I would not be able to have my program and data in core (RAM) memory at the same time. By dimensioning my arrays with a file indicator (e.g., DIM #1, FS(30)=32), I was able to keep all of the data in the arrays on the disk. All changes in the data, such as adding stats, are written to the data file automatically. To modify this, all you'll have to do is read the string and data arrays from the disk file at the beginning of the program and write all the updated information to the file at the end of the program before closing the file. The "=32" portion of the DIM statement tells the computer that the maximum length of a string array element is 32 characters.

Also you might need to make changes in the PRINT USING formatting. Some computers use field symbols different

Sample Run

What is the name of the team ? SAMPLE

Enter the names of the fielders, up to 32 letters each. Use 'RETURN' to end.

1 ? JOHN SMITH
2 ? JACK JONES
3 ?

Now enter the Pitchers.

1 ? JIM WILSON
2 ? MIKE COOPER
3 ?

Ready

RUN ENTER

What is the name of the team ? SAMPLE
What is the Player's name ? JOHN SMITH
Is he a fielder or a pitcher ? F

What are the additions for:
Games, at bats, and runs ? 5,20,2
RBI's, strike outs, and walks ? 11,6,4
Singles, doubles, triples, and home runs ?
4,1,0,1
Sacrifice flies, sacrifice hits, and stolen
bases ? 2,1,3
Hit by pitched balls ? 1
Put-outs, assists, and errors ? 17,11,1

Are all of the additions correct ? Y

Any more additions for this team ? Y

What is the Player's name ? JIM WILSON
Is he a fielder or a pitcher ? P

What are the additions for:
Games, games started, and games completed ?
3,3,2
Innings pitched, runs, and earned runs ?
25,10,8
Strike outs, walks, and fire points ?
30,11,0
Balks and wild pitches ? 1,0
Singles, doubles, triples, and home runs ?
14,3,1,2
Wins, losses, saves, and shut-outs ?
2,1,0,0

from the PDP-11 (see lines 70 through 320 of PRINT). For example, Hewlett-Packard computers use "DDD" or "3D" when DEC Basic would use "###". Another change that might be necessary is in the initialization of the data file. The PDP-11 will create the data file if it has not already been created when that file is accessed. It may be necessary to take care of this and then use the name of the file when asked for the team name.

The first program in the series, called CREATE, runs in 2K. It initializes the stats arrays and lets you type in your fielding and pitching rosters. You are allowed up to 30 fielders and 12 pitchers. These numbers can be changed by altering the number in the DIM statement in line 10 and the loop counters in lines 70 and 120. If you are not running these programs on a PDP-11, you will have to add a line to write the four data arrays to your disk file.

To change your roster at any time, use CHANGE. This 3K program allows you to add or delete players on your pitching or fielding rosters. If a player is deleted, all the players and

their stats after the deleted player are moved up to fill the empty space. Added players are entered after the last player on the current roster. Players cannot be added beyond the limit of the roster. To change the limits see lines 10, 170 and 310.

Entering data from a game is done by using ENTER which runs in 5K. Type in the name of the player whose stats you will be entering. After you tell the computer which roster to use, the program locates the player in the roster and uses the position in the roster as one of the coordinates in the data array. Entry of the data is accomplished by typing in the numbers asked for. If you discover (at the end of entering the data) that you made a mistake, you just have to say that the data is incorrect and the computer will clear the input array and let you start again. After entering the new stats for each player, the input array is added to the data array so that if you make a mistake on the fifth player his stats are the only ones you will have to change. All previous changes are saved before going on to the next player.

Are all of the additions correct ? Y

Any more additions for this team ? Y

RUN PRINT

What is the name of the team ? SAMPLE

Fielding or Pitching stats ? F

Ranked or Individual stats ? R

Which stats, or 'LIST' ? L

Code	Stats
1	Games
2	At Bats
3	Runs
4	Hits

22	Stolen Bases
23	AVG AB Hits HR RBI BB SO
24	PO Assists Errors Fielding Avg

Which stats, or 'LIST' ? 23

Player	AVG	AB	Hits	HR	RBI	BB	SO
JACK JONES	333	21	7	0	8	5	5
JOHN SMITH	300	20	6	1	11	4	6

Any more stats for this team ? Y

Fielding or Pitching stats ? P

Ranked or Individual stats ? R

Which stats, or 'LIST' ? L

Code	Stats
1	Games
2	Games Started
3	Games Completed
4	Innings Pitched

22	Earned Run Average
23	IP H BB SO ER ERA
24	GS GC W L S Win Pct.

Which stats, or 'LIST' ? 23

Player	IP	H	BB	SO	ER	ERA
MIKE COOPER	20	18	9	28	7	3.150
JIM WILSON	25	20	11	30	8	2.880

RUN CHANGE

What is the name of the team ? SAMPLE

Fielding Roster

JOHN SMITH
JACK JONES

Pitching Roster

JIM WILSON
MIKE COOPER

What is the player's name ? TIM JOHNSON

Is he a fielder or a pitcher ? F

ADD or DELETE this player ? A

Any more stats for this team ? Y

Fielding or Pitching stats ? F

Ranked or Individual stats ? I

What is the player's name ? JACK JONES

Stats for JACK JONES

Games	5
At Bats	21
Runs	3
Hits	7
RBI's	8
Singles	4
Doubles	2
Triples	1
Home Runs	0
Walks	5
Strike Outs	5
Sac. Flies	3
Sac. Hits	2
Hit by Pitches	0
Total Bases	11
Put-Outs	15
Assists	16
Errors	2
Fielding Avg	.939394
Batting Avg	.333333
Slugging Avg	.52381
Stolen Bases	4

If you happen to make a mistake and not discover it until later, you can still fix it. Using the 3K program CORREC, you can change the totals for any player on either roster. The method for changing the old data is exactly the same as for entering additional data using ENTER.

By far the most important part of any statistics program is the printout of the accumulated data. The more versatile the printing capabilities, the more useful the program. Printing for this statistics package is done with the 10K program PRINT.

For each set of statistics (fielding and pitching) there are three print options. The first is a standard grouping of stats, much like what is displayed on television during a baseball game. There are two different groups for each set of statistics. The first group of fielding statistics (code #23) contains batting average, at bats, hits, home runs, runs batted in, bases on balls (walks) and strike outs. This group is ranked by batting averages. The second group (code #24) is made up of put-outs, assists, errors and fielding average. The stats are ranked by fielding average. The first group of pitching stats (code #23) consists of innings pitched, hits given up, bases on balls, strike outs, earned runs and earned run average, and is ranked according to earned run averages. The second group (code #24) contains games started, games completed, wins, losses, saves and winning percentage. This group is ranked by winning percentage.

The second option available is to rank players by any one of the 44 available statistics. For a list of these stats, enter LIST when you are asked for your choice of statistics. The third print option will print out all 22 statistics for any individual player.

Most of the statistics used in these programs are fairly obvious, but a few may require some explanation.

- **Runs Batted In:** A batter gets one RBI for each run that scores as a direct result of that batter having hit the ball.
- **Sacrifice flies:** A sacrifice fly occurs when a ball is hit deep to the outfield, advancing a runner already on base.
- **Sacrifice hits:** These are anything except sacrifice flies that result in runner(s) advancing and the batter being put out — for example, bunts and ground balls to the right side of the infield.

To help you change or modify these programs, I've included a variable/line number cross-reference table for each program listing. This table lists all line numbers referenced by GOTO or IF/THEN statements, along with the line number of the statement that branches to that line. Also included references to all variables in the program. A "#" symbol indicates that the line number is the original DIMension statement for that variable. The "@" symbol indicates a destructive reference, or one that changes the value of that particular variable.

Program Listings

CREATE

```

10 DIM #1, F$(30)=32, F(30,22), P$(12)=32, P(12,22)
20 PRINT:INPUT "What is the name of the team ";T$
30 OPEN T$ AS FILE 1
40 MAT F=ZER:MAT P=ZER
50 PRINT:PRINT "Enter the names of the fielders, up to"
60 PRINT "32 letters each. Use 'RETURN' to end.":PRINT
70 FOR L=1 TO 30
80 PRINT L:INPUT F$(L)
90 IF F$(L)="" THEN F$(0)=NUM$(L-1):GOTO 110
100 NEXT L:F$(0)="30"
110 PRINT:PRINT "Now enter the pitchers.":PRINT
120 FOR L=1 TO 12
130 PRINT L:INPUT P$(L)
140 IF P$(L)="" THEN P$(0)=NUM$(L-1):GOTO 160
150 NEXT L:P$(0)="12"
160 CLOSE 1
170 END

```

Cross Reference Listing of CREATE

# 110	90								
# 160	140								
F\$(30)=32, #1	10#	80@	90	90@	100@				
F(30,22), #1	10#	40@							
L	70@	80	80	90	90	100	120@		
	130	130	140	140	150				
P\$(12)=32, #1	10#	130@	140	140@	150@				
P(12,22), #1	10#	40@							
T\$	20@	30							

6 Variables	30 References	20 Statements
152 Name bytes	159 Code bytes	
20 Total time	2 CPU time	

K-Words Reserved	Used	Free
Data 2.42	1.39	1.03
Code .58	.27	.32
Total 3.00	1.66	1.34

CHANGE

```

10 DIM #1, F$(30)=32, F(30,22), P$(12)=32, P(12,22)
20 PRINT:INPUT "What is the name of the team ";T$
30 OPEN T$ AS FILE 1
40 PRINT:PRINT "Fielding Roster"
50 PRINT:FOR L=1 TO VAL(F$(0))
60 PRINT F$(L):NEXT L
70 PRINT:PRINT "Pitching Roster"
80 PRINT:FOR L=1 TO VAL(P$(0))
90 PRINT P$(L):NEXT L
100 PRINT
110 INPUT "What is the player's name ";N$
120 INPUT "Is he a fielder or a pitcher ";R$
130 INPUT "ADD or DELETE this player ";C$
140 R$=LEFT(R$,1):C$=LEFT(C$,1)
150 IF R$="P" THEN 300
160 IF C$="D" THEN 200
170 I=VAL(F$(0)):IF I=30 THEN 460
180 I=I+1:F$(I)=N$:F$(0)=NUM$(I)

```



```

190 GOTO 430
200 I=VAL(F$(0))
210 FOR L=1 TO I
220 IF F$(L)=N$ THEN 250
230 NEXT L
240 GOTO 480
250 FOR D=L TO I-1
260 F$(D)=F$(D+1):FOR Q=1 TO 22:F(D,Q)=F(D+1,Q):NEXT Q
270 NEXT D
280 F$(0)=NUM$(I-1)
290 GOTO 430
300 IF C$="D" THEN 340
310 I=VAL(P$(0)):IF I=12 THEN 470
320 I=I+1:P$(I)=N$:P$(0)=NUM$(I)
330 GOTO 430
340 I=VAL(P$(0))
350 FOR L=1 TO I
360 IF P$(L)=N$ THEN 390
370 NEXT L
380 GOTO 490
390 FOR D=L TO I-1
400 P$(D)=P$(D+1):FOR Q=1 TO 22:P(D,Q)=P(D+1,Q):NEXT Q
410 NEXT D
420 P$(0)=NUM$(I-1)
430 PRINT:INPUT "Any more changes for this team "A$
440 IF LEFT(A$,1)="Y" THEN PRINT:GOTO 110
450 GOTO 500
460 PRINT:PRINT "Your fielding roster is already full.":GOTO 430
470 PRINT:PRINT "Your pitching roster is already full.":GOTO 430
480 PRINT:PRINT N$;" isn't on your fielding roster.":GOTO 430
490 PRINT:PRINT N$;" isn't on your pitching roster.":GOTO 430
500 CLOSE 1
510 END

```

Cross Reference Listing of CHANGE

#	110	440						
#	200	160						
#	250	220						
#	300	150						
#	340	300						
#	390	360						
#	430	190	290	330	460	470	480	490
#	460	170						
#	470	310						
#	480	240						
#	490	380						
#	500	450						
A\$	430@	440						
C\$	130@	140	140@	160	300			
D	250@	260	260	260	260	270	390@	
	400	400	400	400	410			
F\$(30)=32, #1	10#	50	60	170	180@	180@	200	
	220	260	260@	280@				
F(30,22), #1	10#	260	260@					
I	170@	170	180	180@	180	180	200@	
	210	250	280	310@	310	320	320@	
	320	320	340@	350	390	420		
L	50@	60	60	80@	90	90	210@	
	220	230	250	350@	360	370	390	
N\$	110@	180	220	320	360	480	490	
P\$(12)=32, #1	10#	80	90	310	320@	320@	340	
	360	400	400@	420@				
P(12,22), #1	10#	400	400@					
Q	260@	260	260	260	400@	400	400	
	400							
R\$	120@	140	140@	150				
T\$	20@	30						

13 Variables 120 References 64 Statements
269 Name bytes 464 Code bytes
30 Total time 5 CPU time

K-Words Reserved		Used	Free
Data	2.71	1.58	1.13
Code	1.29	.83	.46
Total	4.00	2.41	1.59

Continued

- Total bases: This stat is the sum of all bases a player has safely touched after hitting the ball. He gets one for a single, two for a double and so on.
- Put-outs: A fielder gets a put-out when he is holding the ball and tags the runner or forces him out.
- Assists: A fielder gets an assist when he throws the ball to a fielder who subsequently gets a put-out.
- Fielding average: This figure is the probability that a fielder will not bobble the ball or make a wild throw if a ball is hit to him. It is defined as the sum of put-outs and assists divided by the sum of put-outs, assists and errors.
- Slugging average: This is the average number of bases a player will get each time he comes to bat. It is defined as total bases divided by the number of at bats.
- Balks: A pitcher balks when he makes an illegal motion during his wind-up or delivery.
- Wild pitch: A wild pitch occurs when the pitcher throws a ball that the catcher cannot handle because it was a bad throw.
- Saves: A relief pitcher is credited with a save when he enters a game in which his team is leading, and he finishes the game with a win.
- Fire points: This statistic is used to accurately compare relief pitchers with starting pitchers. A relief pitcher gets one fire point for winning or saving a game.
- Winning percentage: This is defined as the number of wins divided by the number of games pitched.

These programs keep track of just about every statistic that you should need. If you want to add any other stats, you will have to do the following things: 1) change the size of the data arrays; 2) add the input statement and/or calculations necessary in the programs ENTER and CORREC; and 3) add the heading and format strings to the list of data in lines 70 through 320 of PRINT.

To modify this program for statistics other than baseball would require extensive changes, but you would not have to write a whole new set of programs. The same methods used by these programs can easily be adapted for other sports, such as basketball, football and so forth. In fact, there are probably many non-athletic applications for a statistical package of this nature. □

ENTER

```

10 DIM #1, F$(30)=32, F(30,22), P$(12)=32, P(12,22)
20 DIM G(30,22), Q(12,22)
30 PRINT:INPUT "What is the name of the team " ;T$
40 OPEN T$ AS FILE 1
50 REM
60 MAT G=ZER
70 MAT Q=ZER
80 INPUT "What is the player's name " ;N$
90 INPUT "Is he a fielder or a pitcher " ;R$
100 IF LEFT(R$,1)="P" THEN 320
110 FOR L=1 TO VAL(F$(0))
120 IF F$(L)=N$ THEN 140
130 NEXT L:GOTO 530
140 PRINT:PRINT "What are the additions for: "
150 INPUT "Games, at bats, and runs " ;G(L,1),G(L,2),G(L,3)
160 INPUT "RBI's, strike outs, and walks " ;G(L,5),G(L,11),G(L,10)
170 INPUT "Singles, doubles, triples, and home runs " ;G(L,6),G(L,7),
    G(L,8),G(L,9)
180 INPUT "Sacrifice flies, sacrifice hits, and stolen bases " ;
    G(L,12),G(L,13),G(L,22)
190 INPUT "Hit by pitched balls " ;G(L,14)
200 INPUT "Put-outs, assists, and errors " ;G(L,16),G(L,17),G(L,18)
210 PRINT:INPUT "Are all of the additions correct " ;A$
220 IF LEFT(A$,1)="N" THEN 60
230 MAT F=F+G
240 F(L,4)=F(L,6)+F(L,7)+F(L,8)+F(L,9)
250 F(L,15)=F(L,6)+2*F(L,7)+3*F(L,8)+4*F(L,9)
260 F(L,19)=0:IF F(L,16)+F(L,17)+F(L,18)=0 THEN 280
270 F(L,19)=(F(L,16)+F(L,17))/(F(L,16)+F(L,17)+F(L,18))
280 F(L,20)=0:F(L,21)=0:IF F(L,2)=0 THEN 500
290 F(L,20)=1000*F(L,4)/F(L,2)
300 F(L,21)=F(L,15)/F(L,2)
310 GOTO 500
320 FOR L=1 TO VAL(P$(0))
330 IF P$(L)=N$ THEN 350
340 NEXT L:GOTO 540
350 PRINT:PRINT "What are the additions for: "
360 INPUT "Games, games started, and games completed " ;Q(L,1),
    Q(L,2),Q(L,3)
370 INPUT "Innings pitched, runs, and earned runs " ;Q(L,4),Q(L,6),
    Q(L,7)
380 INPUT "Strike outs, walks, and fire points " ;Q(L,8),Q(L,9),
    Q(L,20)
390 INPUT "Balks and wild pitches " ;Q(L,10),Q(L,11)
400 INPUT "Singles, doubles, triples, and home runs " ;Q(L,12),
    Q(L,13),Q(L,14),Q(L,15)
410 INPUT "Wins, losses, saves, and shut-outs " ;Q(L,16),Q(L,17),
    Q(L,18),Q(L,19)
420 PRINT:INPUT "Are all of the additions correct " ;A$
430 IF LEFT(A$,1)="N" THEN 60
440 MAT P=P+Q
450 P(L,5)=P(L,12)+P(L,13)+P(L,14)+P(L,15)
460 P(L,21)=0:IF P(L,1)=0 THEN 480
470 P(L,21)=P(L,16)/P(L,1)
480 P(L,22)=0:IF P(L,4)=0 THEN 500
490 P(L,22)=9*P(L,7)/P(L,4)
500 PRINT:INPUT "Any more additions for this team " ;A$
510 IF LEFT(A$,1)="Y" THEN PRINT:GOTO 60
520 GOTO 550
530 PRINT:PRINT N$;" isn't on your fielding roster.":GOTO 500
540 PRINT:PRINT N$;" isn't on your pitching roster.":GOTO 500
550 CLOSE 1

```

CORREC

```

10 DIM #1, F$(30)=32, F(30,22), P$(12)=32, P(12,22)
20 PRINT:INPUT "What is the name of the team " ;T$
30 OPEN T$ AS FILE 1
40 INPUT "What is the player's name " ;N$
50 INPUT "Is he a fielder or a pitcher " ;R$
60 IF LEFT(R$,1)="P" THEN 250
70 FOR L=1 TO VAL(F$(0))
80 IF F$(L)=N$ THEN 100
90 NEXT L:GOTO 440
100 PRINT:PRINT "What are the totals for: "
110 INPUT "Games, at bats, and runs " ;F(L,1),F(L,2),F(L,3)
120 INPUT "RBI's, strike outs, and walks " ;F(L,5),F(L,11),F(L,10)
130 INPUT "Singles, doubles, triples, and home runs " ;F(L,6),F(L,7),
    F(L,8),F(L,9)
140 INPUT "Sacrifice flies, sacrifice hits, and stolen bases " ;
    F(L,12),F(L,13),F(L,22)
150 INPUT "Hit by pitched balls " ;F(L,14)
160 INPUT "Put-outs, assists, and errors " ;F(L,16),F(L,17),F(L,18)
170 F(L,4)=F(L,6)+F(L,7)+F(L,8)+F(L,9)
180 F(L,15)=F(L,6)+2*F(L,7)+3*F(L,8)+4*F(L,9)
190 F(L,19)=0:IF F(L,16)+F(L,17)+F(L,18)=0 THEN 210
200 F(L,19)=(F(L,16)+F(L,17))/(F(L,16)+F(L,17)+F(L,18))
210 F(L,20)=0:F(L,21)=0:IF F(L,2)=0 THEN 410
220 F(L,20)=1000*F(L,4)/F(L,2)
230 F(L,21)=F(L,15)/F(L,2)
240 GOTO 410
250 FOR L=1 TO VAL(P$(0))
260 IF P$(L)=N$ THEN 280
270 NEXT L:GOTO 450
280 PRINT:PRINT "What are the totals for: "
290 INPUT "Games, games started, and games completed " ;P(L,1),
    P(L,2),P(L,3)
300 INPUT "Innings pitched, runs, and earned runs " ;P(L,4),P(L,6),
    P(L,7)
310 INPUT "Strike outs, walks, and fire points " ;P(L,8),P(L,9),
    P(L,20)
320 INPUT "Balks and wild pitches " ;P(L,10),P(L,11)
330 INPUT "Singles, doubles, triples, and home runs " ;P(L,12),
    P(L,13),P(L,14),P(L,15)
340 INPUT "Wins, losses, saves, and shut-outs " ;P(L,16),P(L,17),
    P(L,18),P(L,19)
350 P(L,5)=P(L,12)+P(L,13)+P(L,14)+P(L,15)
360 REM
370 P(L,21)=0:IF P(L,1)=0 THEN 390
380 P(L,21)=P(L,16)/P(L,1)
390 P(L,22)=0:IF P(L,4)=0 THEN 410
400 P(L,22)=9*P(L,7)/P(L,4)
410 PRINT:INPUT "Any more changes for this team " ;A$
420 IF LEFT(A$,1)="Y" THEN PRINT:GOTO 40
430 GOTO 460
440 PRINT:PRINT N$;" isn't on your fielding roster.":GOTO 410
450 PRINT:PRINT N$;" isn't on your pitching roster.":GOTO 410
460 CLOSE 1
470 END

```


Cross Reference Listing of ENTER

#	60	220	430	510			
#	140	120					
#	280	260					
#	320	100					
#	350	330					
#	480	460					
#	500	280	310	480	530	540	
#	530	130					
#	540	340					
#	550	520					
A\$	210@	220	420@	430	500@	510	
F\$(30)=32, #1	10#	110	120				
F(30,22), #1	10#	230	230@	240	240	240	240
	240@	250	250	250	250@	260@	
	260	260	260	270	270	270	
	270	270@	280@	280@	280	290	290
	290@	300	300	300@			
G(30,22)	20#	60@	150@	150@	150@	160@	160@
	160@	170@	170@	170@	180@	180@	
	180@	190@	200@	200@	200@	230	
L	110@	120	130	150	150	160	
	160	160	170	170	170	180	
	180	180	190	200	200	240	
	240	240	240	250	250	250	
	250	250	260	260	260	270	
	270	270	270	270	280	280	
	280	290	290	300	300	300	
	320@	330	340	360	360	370	
	370	370	380	380	390	390	
	400	400	400	400	410	410	
	410	450	450	450	450	460	
	460	470	470	470	480	480	
	490	490					
N\$	80@	120	330	530	540		
P\$(12)=32, #1	10#	320	330				
P(12,22), #1	10#	440	440@	450	450	450	450
	450@	460@	460	470	470	470@	480@
	480	490	490	490@			
Q(12,22)	20#	70@	360@	360@	360@	370@	370@
	370@	380@	380@	380@	390@	390@	400@
	400@	400@	400@	410@	410@	410@	410@
	440						
R\$	90@	100					
T\$	30@	40					

11 Variables	215 References	60 Statements
252 Name bytes	866 Code bytes	
94 Total time	7 CPU time	

K-Words Reserved	Used	Free
Data 2.57	1.78	.79
Code 1.43	1.15	.28
Total 4.00	2.93	1.07

Cross Reference Listing of CORREC

#	40	420					
#	100	80					
#	210	190					
#	250	60					
#	280	260					
#	390	370					
#	410	210	240	390	440	450	
#	440	90					
#	450	270					
#	460	430					
A\$	410@	420					
F\$(30)=32, #1	10#	70	80				
F(30,22), #1	10#	110@	110@	110@	120@	120@	120@
	130@	130@	130@	130@	140@	140@	140@
	150@	160@	160@	160@	170	170	170
	170	170@	180	180	180	180	180@
	190@	190	190	190	200	200	200
	200	200	200@	210@	210@	210	220
	220	220@	230	230	230@		
L	70@	80	90	110	110	110	120
	120	120	130	130	130	130	140
	140	140	150	160	160	160	170
	170	170	170	170	180	180	180
	180	180	190	190	190	190	200
	200	200	200	200	200	210	210
	210	220	220	220	230	230	230
	250@	260	270	290	290	290	300
	300	300	310	310	310	320	320
	330	330	330	330	340	340	340
	340	350	350	350	350	350	370
	370	380	380	380	390	390	400
	400	400					
N\$	40@	80	260	440	450		
P\$(12)=32, #1	10#	250	260				
P(12,22), #1	10#	290@	290@	290@	300@	300@	300@
	310@	310@	310@	320@	320@	330@	330@
	330@	330@	340@	340@	340@	340@	350
	350	350	350	350@	370@	370	380
	380	380@	390@	390	400	400	400@
R\$	50@	60					
T\$	20@	30					

9 Variables	199 References	50 Statements
188 Name bytes	803 Code bytes	
66 Total time	6 CPU time	

K-Words Reserved	Used	Free
Data 2.44	1.70	.74
Code 1.56	1.03	.53
Total 4.00	2.73	1.27

PRINT

```

10 DIM #1, F$(30)=32, F(30,22), P$(12)=32, P(12,22)
20 DIM G$(24,2), G(30), Q$(24,2), Q(12)
30 FOR X=1 TO 24:FOR Y=1 TO 2
40 READ G$(X,Y):NEXT Y:NEXT X
50 FOR X=1 TO 24:FOR Y=1 TO 2
60 READ Q$(X,Y):NEXT Y:NEXT X
70 DATA "Games", "   ", "At Bats", "   ", "Runs", "   ", "Hits", "   "
80 DATA "RBI's", "   ", "Singles", "   ", "Doubles", "   "
90 DATA "Triples", "   ", "Home Runs", "   ", "Walks", "   "
100 DATA "Strike Outs", "   ", "Sac. Flies", "   "
110 DATA "Sac. Hits", "   ", "Hit by Pitches", "   "
120 DATA "Total Bases", "   ", "Put-Outs", "   ", "Assists"
130 DATA "   ", "Errors", "   ", "Fielding Avg", "   "
140 DATA "Batting Avg", "   ", "Slugging Avg", "   "
150 DATA "Stolen Bases", "   "
160 DATA " AVG  AB Hits HR RBI  BB  SO"
170 DATA "####  ###  ###  ##  ###  ##  ###"
180 DATA " PO Assists Errors Fielding Avg"
190 DATA "###  ###  ###  #.###"
200 DATA "Games", "   ", "Games Started", "   "
210 DATA "Games Completed", "   ", "Innings Pitched"
220 DATA "   ", "Hits", "   ", "Runs", "   ", "Earned Runs"
230 DATA "   ", "Strike Outs", "   ", "Base on Balls"
240 DATA "   ", "Balks", "   ", "Wild Pitches", "   "
250 DATA "Singles", "   ", "Doubles", "   ", "Triples", "   "
260 DATA "Home Runs", "   ", "Wins", "   ", "Losses", "   "
270 DATA "Saves", "   ", "Shut-Outs", "   ", "Fire Points", "   "
280 DATA "Win Pct.", "   ", "Earned Run Average", "   "
290 DATA " IP  H  BB  SO  ER  ERA"
300 DATA "###  ###  ###  ###  ###  ###"
310 DATA " GS  GC  W  L  S  Win Pct."
320 DATA "###  ###  ##  ##  ##  #.###"
330 PRINT:INPUT "What is the name of the team ";T$
340 OPEN T$ AS FILE 1
350 INPUT "Fielding or Pitching stats ";R$
360 INPUT "Ranked or Individual stats ";M$
370 IF LEFT(R$,1)="P" THEN 750
380 IF LEFT(M$,1)="I" THEN 670
390 INPUT "Which stats, or 'LIST' ";C$
400 IF LEFT(C$,1) <> "L" THEN 450
410 PRINT:PRINT "Code Stats"
420 FOR L=1 TO 24
430 PRINT L;TAB(8);G$(L,1)
440 NEXT L:GOTO 390
450 Q=VAL(C$):Z=VAL(F$(Q))
460 IF Q=23 THEN R=20:GOTO 490
470 IF Q=24 THEN R=19:GOTO 490
480 R=Q
490 FOR L=1 TO Z:G(L)=L:NEXT L
500 FOR X=1 TO Z-1
510 FOR Y=X TO Z
520 IF F(G(X),R)>F(G(Y),R) THEN 540
530 J=G(X):G(X)=G(Y):G(Y)=J
540 NEXT Y:NEXT X

```

```

1110 NEXT L
1120 PRINT:INPUT "Any more stats for this team ";A$
1130 IF LEFT(A$,1)="Y" THEN 350
1140 CLOSE 1
1150 END

```

Cross Reference Listing of PRINT

#	350	1130							
#	390	440							
#	450	400							
#	490	460	470						
#	540	520							
#	610	560							
#	640	570							
#	670	380							
#	720	690							
#	750	370							
#	760	810							
#	820	770							
#	860	830	840						
#	910	890							
#	980	930							
#	1010	940							
#	1040	750							
#	1090	1060							
#	1120	600	630	660	710	740	970	1000	
		1030	1080						
A\$	1120@	1130							
C\$	390@	400	450	760@	770	820			
F\$(30)=32, #1	10#	450	580	610	640	680	690		
F(30,22), #1	10#	520	520	590	620	620	620		
	620	620	620	620	650	650	650		
	650	730							
G\$(24,2)	20#	40@	430	550	590	620	650		
	730								
G(30)	20#	490@	520	520	530	530	530@		
	530@	580	590	610	620	620	620		
	620	620	620	620	640	650	650		
	650	650							
J	530@	530	900@	900					
L	420@	430	430	440	490@	490	490		


```

550 PRINT:PRINT: PRINT "Player";TAB(32);G$(Q,1):PRINT
560 IF Q=23 THEN 610
570 IF Q=24 THEN 640
580 FOR L=1 TO Z:PRINT F$(G(L));TAB(32);
590 PRINT USING G$(Q,2);F(G(L),Q)
600 NEXT L:GOTO 1120
610 FOR L=1 TO Z:PRINT F$(G(L));TAB(32);
620 PRINT USING G$(Q,2);F(G(L),20);F(G(L),2);F(G(L),4);F(G(L),9);
    F(G(L),5);F(G(L),10);F(G(L),11)
630 NEXT L:GOTO 1120
640 FOR L=1 TO Z:PRINT F$(G(L));TAB(32);
650 PRINT USING G$(Q,2);F(G(L),16);F(G(L),17);F(G(L),18);F(G(L),19)
660 NEXT L:GOTO 1120
670 PRINT:INPUT "What is the player's name ";N$
680 FOR L=1 TO VAL(F$(0))
690 IF F$(L)=N$ THEN Q=L:GOTO 720
700 NEXT L:PRINT
710 PRINT N$;" isn't on your fielding roster.":GOTO 1120
720 PRINT:PRINT "Stats for ";N$
730 FOR L=1 TO 22:PRINT G$(L,1);TAB(32);F(Q,L)
740 NEXT L:GOTO 1120
750 IF LEFT(M$,1)="I" THEN 1040
760 INPUT "Which stats, or 'LIST' ";C$
770 IF LEFT(C$,1) <> "L" THEN 820
780 PRINT:PRINT "Code Stats"
790 FOR L=1 TO 24
800 PRINT L;TAB(8);Q$(L,1)
810 NEXT L:GOTO 760
820 Q=VAL(C$);Z=VAL(P$(0))
830 IF Q=23 THEN R=22:GOTO 860
840 IF Q=24 THEN R=21:GOTO 860
850 R=Q
860 FOR L=1 TO Z:Q(L)=L:NEXT L
870 FOR X=1 TO Z-1
880 FOR Y=X TO Z
890 IF P(Q(X),R)>P(Q(Y),R) THEN 910
900 J=Q(X):Q(X)=Q(Y):Q(Y)=J
910 NEXT Y:NEXT X
920 PRINT:PRINT:PRINT "Player";TAB(32);Q$(Q,1):PRINT
930 IF Q=23 THEN 980
940 IF Q=24 THEN 1010
950 FOR L=1 TO Z:PRINT P$(Q(L));TAB(32);
960 PRINT USING Q$(Q,2);P(Q(L),Q)
970 NEXT L:GOTO 1120
980 FOR L=1 TO Z:PRINT P$(Q(L));TAB(32);
990 PRINT USING Q$(Q,2);P(Q(L),4);P(Q(L),5);P(Q(L),9);P(Q(L),8);
    P(Q(L),7);P(Q(L),22)
1000 NEXT L:GOTO 1120
1010 FOR L=1 TO Z:PRINT P$(Q(L));TAB(32);
1020 PRINT USING Q$(Q,2);P(Q(L),2);P(Q(L),3);P(Q(L),16);P(Q(L),17);
    P(Q(L),18);P(Q(L),21)
1030 NEXT L:GOTO 1120
1040 PRINT:INPUT "What is the player's name ";N$
1050 FOR L=1 TO VAL(P$(0))
1060 IF F$(L)=N$ THEN Q=L:GOTO 1090
1070 NEXT L:PRINT
1080 PRINT N$;" isn't on your pitching roster.":GOTO 1120
1090 PRINT:PRINT "Stats for ";N$
1100 FOR L=1 TO 22:PRINT G$(L,1);TAB(32);F(Q,L)

```

	490	580@	580	590	600	610@	610
	620	620	620	620	620	620	620
	630	640@	640	650	650	650	650
	660	680@	690	690	700	730@	730
	730	740	790@	800	800	810	860@
	860	860	860	950@	950	960	970
	980@	980	990	990	990	990	990
	990	1000	1010@	1010	1020	1020	1020
	1020	1020	1020	1030	1050@	1060	1060
	1070	1100@	1100	1100	1110		
M\$	360@	380	750				
N\$	670@	690	710	720	1040@	1060	1080
	1090						
P\$(12)=32, #1	10#	820	950	980	1010	1050	1060
P(12,22), #1	10#	890	890	960	990	990	990
	990	990	990	1020	1020	1020	1020
	1020	1020	1100				
Q	450@	460	470	480	550	560	570
	590	590	620	650	690@	730	820@
	830	840	850	920	930	940	960
	960	990	1020	1060@	1100		
Q\$(24,2)	20#	60@	800	920	960	990	1020
	1100						
Q(12)	20#	860@	890	890	900	900	900@
	900@	950	960	980	990	990	990
	990	990	990	1010	1020	1020	1020
	1020	1020	1020				
R	460@	470@	480@	520	520	830@	840@
	850@	890	890				
R\$	350@	370					
T\$	330@	340					
X	30@	40	40	50@	60	60	500@
	510	520	530	530	540	870@	880
	890	900	900	910			
Y	30@	40	40	50@	60	60	510@
	520	530	530	540	880@	890	900
	900	910					
Z	450@	490	500	510	580	610	640
	820@	860	870	880	950	980	1010

21 Variables	325 References	121 Statements
420 Name bytes	1153 Code bytes	
125 Total time	13 CPU time	
K-Words Reserved	Used	Free
Data	2.67	.92
Code	3.33	.69
Total	6.00	1.62

Home Librarian

—BY PATRICK SESLAR—

Some time ago, I developed a penchant for collecting books. Large books, small books, red ones, blue ones, mystery, fiction, how-to-do-it — all manner of books were constantly accumulating in my personal library.

The only real problem was that I didn't have a library! At least, not in the sense you usually think of a library. I never had one entire room that I could set aside as a central repository for my rapidly growing collection. In the absence of such a room, nature — or possibly some corollary to Murphy's Law — took over and the books gradually found their way to various closets, shelves and dark attic corners.

This was all well and good as long as I could remember in which corner or closet I had last seen a particular book. However, as the number of books, closets and corners multiplied over the years, my mental powers could not keep up to the task. The situation rapidly came to the point of losing a few books or losing my mind!

I briefly considered instituting the Dewey decimal system, but quickly discarded that idea since it would mean a monumental organizational task. (Monumental Organizational Task = anything I don't readily understand!) At this point I thought of a simple method of organizing and locating my books — a method that practically eliminated the need to disturb any of my tomes from their various dusty retreats.

The procedure is simple. With clipboard in hand, I moved from one dark corner to another. I called the first location #1, the second #2, and so forth until I visited all the places where I kept my books. While at each location, I recorded the author and title of each book, and assigned it a classification (mystery, reference, etc.). Finally, I numbered the titles on the page consecutively beginning with 1. To each book, I attached a self stick dot with the same number. At the next location, I repeated the procedure, numbering those books with the next number in

Mr. Seslar also wrote "TV Typist" (January 1980 PC.).

Program Listing

```
10 PL0T 12
20 PRINTAB(30);"HOME LIBRARIAN":PRINT:PRINT
30 PRINT "SERVICES AVAILABLE: "
40 PRINTTAB(5);"LIST SUBJECT CLASSIFICATIONS.....1"
50 PRINTTAB(5);"LIST BOOKS BY LOCATION.....2"
60 PRINTTAB(5);"LIST BOOKS BY SELECTED AUTHOR.....3"
70 PRINTTAB(5);"FIND SELECTED TITLE.....4"
80 PRINTTAB(5);"SEARCH FOR TITLE BY KEY WORD.....5"
90 PRINTTAB(5);"NO FURTHER SERVICE DESIRED.....6"
100 PRINT:PRINT
110 INPUT"# OF SERVICE DESIRED.....?";N
120 IF N>0 AND N<7 THEN 140
130 PL0T 12:PRINT "SELECT A NUMBER BETWEEN 1 AND 6":
    PRINT:G0T0 30
140 ON N G0T0 150,370,530,550,780,10000
150 PL0T 12:PRINT "SUBJECT CLASSIFICATIONS":PRINT
160 PRINTTAB(5);"ARTS & CRAFTS.....1"
170 PRINTTAB(5);"FICTION.....2"
180 PRINTTAB(5);"HISTORY.....3"
190 PRINTTAB(5);"MYSTERY.....4"
200 PRINTTAB(5);"REFERENCE.....5"
210 PRINTTAB(5);"SCIENCE.....6"
220 PRINT:PRINT
230 PRINT "WOULD YOU LIKE TO SEE A LIST OF TITLES AVAILABLE"
240 INPUT "IN ONE OF THE ABOVE CLASSIFICATIONS (Y/N)? ";A$
250 IF LEFT$(A$,1) = "N" THEN 10
260 PRINT:INPUT "ENTER CLASSIFICATION #...? ";C1:PRINT
270 FOR X=1 TO 100
280 READ L,B,C,AN$,TL$
290 IF AN$ = "LAST" THEN 350
300 IF C1<>C THEN 350
310 G0SUB 950
350 NEXT
360 INPUT "ENTER 'C' TO G0 ON";C$:RESTORE:G0T0 10
370 PL0T 12:PRINT "BOOK LOCATIONS":PRINT
380 PRINTTAB(5);"LIVING ROOM.....1"
390 PRINTTAB(5);"WORKSHOP.....2"
400 PRINTTAB(5);"ATTIC.....3"
410 PRINTTAB(5);"DEN.....4"
420 PRINT:INPUT "ENTER LOCATION # TO BE LISTED";L1:PRINT
430 FOR X=1 TO 100
440 READ L,B,C,AN$,TL$
450 IF AN$ = "LAST" THEN 520
460 IF L1<>L THEN 510
470 G0SUB 950
510 NEXT
520 INPUT "ENTER 'C' TO CONTINUE";C$:RESTORE:G0T0 10
530 PL0T 12:INPUT "ENTER NAME OF AUTHOR...? ";NA$:PRINT
540 LN = LEN(NA$)
550 FOR X=1 TO 100
560 READ L,B,C,AN$,TL$
570 IF AN$ = "LAST" THEN 540
580 IF LEFT$(AN$,LN)<>NA$ THEN 530
590 G0SUB 950
630 NEXT
640 INPUT "ENTER 'C' TO CONTINUE";C$:RESTORE:G0T0 10
650 PL0T 12:INPUT "ENTER DESIRED TITLE...? ";DT$:PRINT
660 FOR X=1 TO 100
670 READ L,B,C,AN$,TL$
680 IF AN$ = "LAST" THEN 750
690 IF TL$ = DT$ THEN 710
700 G0T0 750
710 G0SUB 950
740 INPUT "ENTER 'C' TO CONTINUE";C$:RESTORE:G0T0 10
750 NEXT
```



```

750 PLOT 12:PRINT "NO EXACT MATCH FOUND. TRY KEY WORD"
770 PRINT:PRINT:RESTORE
780 INPUT "ENTER KEY WORD OF DESIRED TITLE ";KWS:PRINT
790 RESTORE:LW = LEN(KWS)
800 FOR X=1 TO 100
810 READ L,B,C,ANS,TL$
820 IF ANS = "LAST" THEN 930
830 FOR Y=1 TO LEN(TL$)+1-LW
840 IF KWS = MIDS(TL$,Y,LW) THEN 850
850 NEXT Y:GOTO 920
850 GOSUB 950
900 INPUT "CONTINUE SEARCH? (Y/N)... ";CSS
910 IF LEFT$(CSS,1) = "N" THEN 10
920 NEXT
930 PRINT "SEARCH COMPLETE"
940 INPUT "ENTER 'C' TO CONTINUE";CS:RESTORE:GOTO 10
950 ON L GOTO 951,952,953,954,955
951 L$ = "LIVING ROOM":GOTO 960
952 L$ = "WORKSHOP":GOTO 960
953 L$ = "ATTIC":GOTO 960
954 L$ = "DEN":GOTO 960
955 L$ = "INCORRECT":GOTO 960
960 PRINT "TITLE: ";TL$
961 PRINT "AUTHOR: ";ANS
962 PRINT "BOOK #: ";B;" LOCATION IS: ";L$
953 PRINT:PRINT:RETURN
1000 DATA 1,1,3,MASSIE,NICHOLAS & ALEXANDRA
1010 DATA 1,2,4,CHARTERIS,MEET THE TIGER
1020 DATA 1,3,4,CHARTERIS,ENTER THE SAINT
1030 DATA 1,4,2,LUDDLUM,THE MATARESE CIRCLE
1040 DATA 1,5,2,WOUK,WAR AND REMEMBRANCE
1050 DATA 2,5,1,MEILACH,CREATIVE CARVING
1060 DATA 2,7,1,BIEGELEISEN,SCREEN PRINTING
1070 DATA 3,8,5,ANDERSON,THE SOLAR HOME BOOK
1080 DATA 4,9,3,ARNASON,HISTORY OF MODERN ART
1090 DATA 4,10,5,MC GLYNN,MICROPROCESSORS
1100 DATA 4,11,6,WALKER,THE FLYING CIRCUS OF PHYSICS
10000 DATA 1,1,1,LAST,NONE

```

Sample Run

```

SERVICES AVAILABLE:
  LIST SUBJECT CLASSIFICATIONS.....1
  LIST BOOKS BY LOCATION.....2
  LIST BOOKS BY SELECTED AUTHOR.....3
  FIND SELECTED TITLE.....4
  SEARCH FOR TITLE BY KEY WORD.....5
  NO FURTHER SERVICE DESIRED.....6

# OF SERVICE DESIRED.....?1

SUBJECT CLASSIFICATIONS:

  ARTS & CRAFTS.....1
  FICTION.....2
  HISTORY.....3
  MYSTERY.....4
  REFERENCE.....5
  SCIENCE.....6

WOULD YOU LIKE TO SEE A LIST OF TITLES AVAILABLE
IN ONE OF THE ABOVE CLASSIFICATIONS (Y/N)? Y

ENTER CLASSIFICATION #....? 2

TITLE: THE MATARESE CIRCLE
AUTHOR: LUDDLUM
BOOK #: 4 LOCATION IS: LIVING ROOM

TITLE: WAR AND REMEMBRANCE
AUTHOR: WOUK
BOOK #: 5 LOCATION IS: LIVING ROOM

ENTER 'C' TO GO ON

```

Continued

sequence after those assigned at the first location.

When all the locations had been visited, I had recorded the title and author of every book in my possession as well as classified all. Each book had its own number somewhere between 1 and the total number of books I found. With this information and my trusty computer, I can quickly tell which heap to look in, and how deep to dig!

Because of my short memory, I organized the program to list the services it could provide by number. I further arranged the program to return to that same list of services after each cycle use so that on any given run of the program I can use any number of its capabilities. In the Sample Runs, you can see how the program returns to the starting "list of services" after each cycle. You can also see the nature of service provided by each option.

Service option 5 is especially useful, particularly if you can't quite remember the title of the book you want. All you need remember is one word, or even a portion of a word, from the title. The program will examine each title in memory for that exact sequence of letters and will then retrieve the information if a match can be found. This option executes slower than any of the others because it performs more machine operations. As the number of books in memory increases, so will the execution time for this option. Still, it'll be a lot faster than rummaging through all the nooks and crannies in your home looking for a book whose title you can't quite remember.

My system is a CompuColor with 16K user RAM. My rough memory calculations indicate that the program will accommodate over 300 books in this amount of memory. I personally have several hundred books, but I've only included eleven for sample data to demonstrate the program's operation, which is fairly straightforward. The PLOT 12 command (line 10 and elsewhere) clears the screen. Most other instructions have similar counterparts in other Basics.

One parting thought: Although I use this program to organize my personal library, you could just as easily use it in a business environment. With only minor modifications, it could keep track of business records stored at various locations, or possibly record the location and condition of major business equipment (such as a building contractor's trucks, dozers, concrete mixers and so forth) which are located at different job sites. □

Sample Run continued

SERVICES AVAILABLE:

LIST SUBJECT CLASSIFICATIONS.....1
LIST BOOKS BY LOCATION.....2
LIST BOOKS BY SELECTED AUTHOR.....3
FIND SELECTED TITLE.....4
SEARCH FOR TITLE BY KEY WORD.....5
NO FURTHER SERVICE DESIRED.....5

OF SERVICE DESIRED.....?4

ENTER DESIRED TITLE..? THE FLYING CIRCUS
OF PHYSICS

TITLE: THE FLYING CIRCUS OF PHYSICS
AUTHOR: WALKER

BOOK #: 11 LOCATION IS: DEN

ENTER 'C' TO CONTINUE

OF SERVICE DESIRED.....?5

ENTER KEY WORD OF DESIRED TITLE: PRINTING

TITLE: SCREEN PRINTING
AUTHOR: BIEGELEISEN
BOOK #: 7 LOCATION IS: WORKSHOP

CONTINUE SEARCH? (Y/N)... Y
SEARCH COMPLETE
ENTER 'C' TO CONTINUE

OF SERVICE DESIRED.....?2

BOOK LOCATIONS:

LIVING ROOM.....1
WORKSHOP.....2
ATTIC.....3
DEN.....4

ENTER LOCATION # TO BE LISTED: 2

TITLE: CREATIVE CARVING
AUTHOR: MEILACH
BOOK #: 5 LOCATION IS: WORKSHOP

TITLE: SCREEN PRINTING
AUTHOR: BIEGELEISEN
BOOK #: 7 LOCATION IS: WORKSHOP

ENTER 'C' TO CONTINUE

OF SERVICE DESIRED.....?3

ENTER NAME OF AUTHOR..? MASSIE

TITLE: NICHOLAS & ALEXANDRA
AUTHOR: MASSIE
BOOK #: 1 LOCATION IS: LIVING ROOM

ENTER 'C' TO CONTINUE



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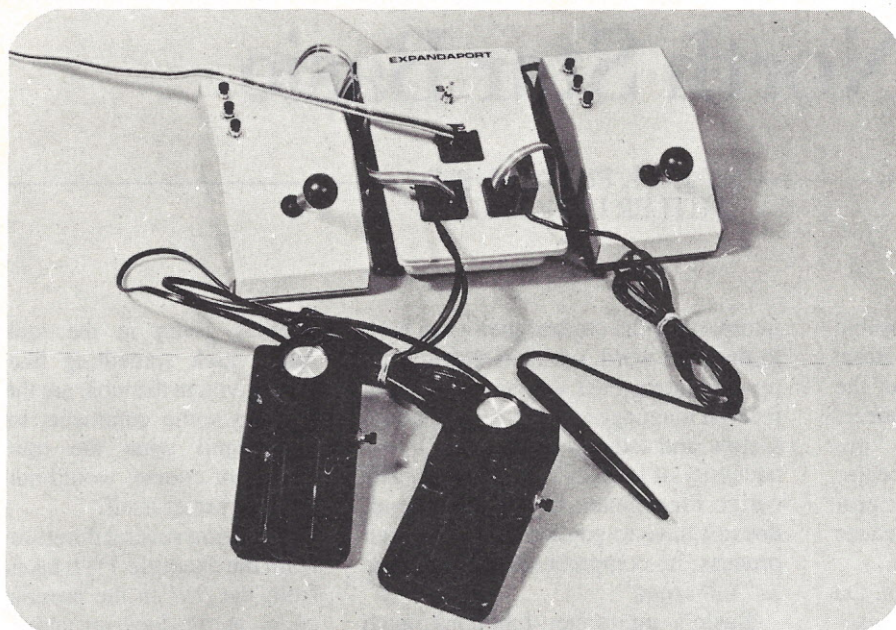
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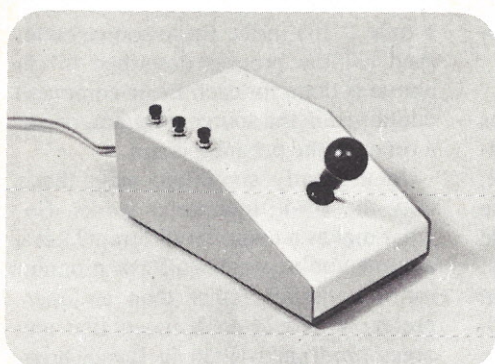


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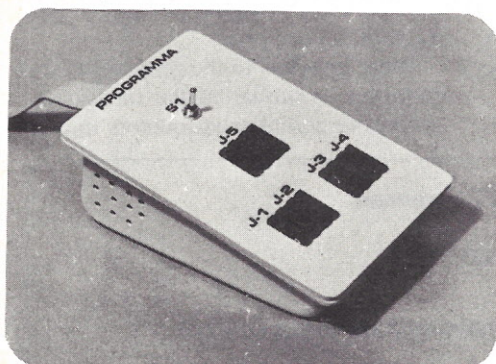


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Adding Overdrive to North Star Basic

—BY JACK PURDUM, PhD—
BUTLER UNIVERSITY

One of the more enjoyable courses I teach each year is Basic programming. One of the goals of the course is not only to teach the students how to program, but also how to "optimize" their programs. For the beginning student, minor changes in the program structure will often greatly reduce the execution time of the program.

With a few possible exceptions, the primary reason for slow program execution is usually one or more FOR-NEXT loops. Changing the algorithm sometimes improves the speed, but the time in the loops can only be reduced so much through "finesse".

Ignoring the hardware side of the issue, the limit ultimately is set by the execution speed of the Basic interpreter itself. And, unless you are a glutton for punishment, you leave the Basic interpreter alone and learn to live with it.

Fortunately for users of North Star Basic, Allen Ashley is a glutton for punishment. What Mr. Ashley has done for us is develop an "add-on" compiler for North Star Basic. The results can be dramatic, to say the least.

So, What's a Compiler?

To appreciate what Mr. Ashley has done for us, we first must understand the difference between an interpreter and a compiler. The two can be likened to a beginning French student compared to a native Frenchman. Suppose, for example, the beginning student sees the word "chambre" and, having no idea what it means, goes to his French-English dictionary and looks-up the word to find its English "interpretation." Once the word is looked up and

Dr. Purdum is an Associate Professor of Economics at Butler University in Indianapolis, IN, where he teaches courses in microcomputers to the College of Business for use in management science, statistics and other courses of study.

interpreted, the student then goes back to the next word, which is then looked up and interpreted and so on. As any foreign language student knows, this is a slow and tedious process due to the necessity of looking up each word. The native Frenchman, on the other hand, doesn't have to go through the look-up process; he comprehends the language at "full speed".

Basic's interpreter functions much the same way as our beginning French student. A Basic program is similar to a French essay and the Basic interpreter is the French-English dictionary.

Consider, for example, a simple program line used to print a blank line.

10 !

When a North Star Basic program tries to execute line 10, it sees the exclamation mark and, like our French student, it doesn't know what "!" means. The program then goes to a look-up table and searches for what "!" means. Since the table has the exclamation mark in it, there will be a memory address associated with the symbol. The program then transfers control to that address and begins the execution of the PRINT command as given in line 10. If the symbol were not in the table, the program would issue a SYNTAX ERROR.

What is actually found at the PRINT

address given in the look-up table might look something like Table 1. Also given in the table are the mnemonics and some comments to help you understand what the routine does. These, of course, would not be part of the interpreter itself.

There are several things to be learned from the example: (1) It takes time to go from the "!" in the program's source code, to the look-up table, to the assembly language routine (like the one in Table 1) and then back to the Basic source program. (2) The 11 bytes of code in Table 1 are abbreviated by only 1 byte ("!") in the Basic source code. And (3) the process described in (1) above is done for each Basic command contained in the source program, one at a time, as the program is run.

In a greatly simplified way, that's how the Basic interpreter works. So, what makes a compiler different? Let's assume you've written a Basic program for a compiler rather than an interpreter. It would look much like any other program written in Basic; however, when you've finished writing it, it is not ready to be executed. You must first pass the program you've written through the compiler.

What happens to the program in the compiler is similar to the interpreter. When the compiler encounters line 10

Sample Interpreter for the PRINT command:

DB 06 E6 01 CA 00 30 78 D3 01 C9

Expanded Version of the above (not found in the Interpreter):

3000	DB 06	IN 06	Get Status Port
	E6 01	ANI 01	Mask Off Input status Bit
	CA 00 30	JZ 3000	Loop if busy
	78	MOV A,B	Put Character in A
	D3 01	OUT 01	Send it to Port 1
	C9	RET	Go back where we left off

Table 1

in our example, it would see the "!", go to a look-up table for the address of the appropriate PRINT subroutine (like the one in Table 1) and then *replace* the "!" with the contents of Table 1. (There would be some differences, such as the deletion of the RET statement in the subroutine.) In other words, the one-byte "!" is compiled into the equivalent 11-byte subroutine *before* the program is run and not *while* the program is run.

Reducing things to their simplest terms, an interpreter "compiles" the program while it's being run, but the compiler does the compilation before the program is run. To drive the point home, suppose we put our simple PRINT statement in a loop so our program looks like:

```
10 FOR J=1 TO N
20 !
30 NEXT J
```

If this loop were run by an interpreter, line 20 would be "compiled" N times during the execution of the loop. If the loop is run through a compiler first, the "!" is already in executable form, so there is no need to compile it N times. In fact, in its compiled form, the loop can be shared by other parts of the program where loops are similarly used by supplying the argument N. It should be clear that, as the value of N increases, the time saved in executing the loop can become substantial.

Ashley's HDS and CDS

Given what we've already learned, wouldn't it be nice to compile those time-consuming FOR-NEXT loops, but leave the rest of the Basic program in its interpretive (often shorter) form? This is exactly what Allen Ashley's HDS and CDS software packages allow you to do by permitting a North Star Basic program to shift into overdrive when the program encounters a compiled FOR-NEXT (or other) program segment.

The system is comprised of two parts: the Hybrid Development System and the Compiler Development System. Essentially, HDS takes care of the changes that must be made to North Star Basic to support the compiler. To the end user, the changes involve little more than loading your present copy of North Star Basic, running the HDS program and answering a few questions along the way. HDS also contains another program (OVLADER) that permits the file containing the object code to be loaded as part of the Basic program. In other words, you don't have to load the compiled program segment and the Basic program separately.

Direct Commands

SAVE FILE
SCR
DEL

LOAD FILE
LIST
RUN

Executable Commands (NOTE: the commands given below are part of IBASIC. However, all North Star Basic commands may be used; they are treated as references to North Star Basic by the compiler.):

FOR-TO-STEP
IF-THEN-ELSE
GOTO
RETURN
PRINT
STOP
FILL

NEXT
LET
GOSUB
INUT (numeric or string)
END
OUT

Functions:

CALL
INP
SGN
NOT

EXAM
RND
ABS
FIX (floating point expression)

Arithmetic Operations:

The normal arithmetic operations are all supported and may be integer or floating point operands. Operands may not be mixed, however. IBASIC also has a MOD operation that returns the modulo of an expression.

Relational and Logic Operations:

The full compliment of relational operators are supported, as well as the logical operations of AND, OR and XRA (exclusive OR).

Table 2 IBASIC Commands

The heart of the package, however, is CDS. This system enables you to take part of a Basic program and compile it into its assembly language equivalent. For those that might be interested, a side benefit is that compiled sections of a program that is proprietary in nature can be given an increased degree of protection, since few end users are willing to wade through an assembly language program.

Using the Compiler

There are five steps that must be followed to compile a program. The first is to write the section of the program that is to be compiled in a way that is understood by the compiler. Included as part of CDS is an integer Basic, called IBASIC, that performs this task for the compiler. A list of the commands supported by IBASIC is given in Table 2.

After the program segment to be compiled is written in IBASIC and saved in a disk file, the second step is to load and execute the compiler. It reads the IBASIC program from the disk and converts it into an assembly source code program. This conversion is done

automatically by the compiler and results are saved in another disk file. Note that operations that cannot be executed by IBASIC are treated as references to North Star Basic by the compiler.

The third step is to execute a program called MAKRO, which actually generates the assembly language (object code) program from the source code produced by the compiler. MAKRO also establishes which additional subroutines are necessary for completion of the program segment. (Anyone who has gone through the pain and pleasure of assembly language programming will probably get a slight tingling sensation as they see the assembly language code from MAKRO scroll by on the monitor.) The output from MAKRO is then saved in a disk file.

The fourth step is to execute LINKED which takes the output of MAKRO and fills in the subroutines needed to produce an executable program. This step results in the executable object code, also saved in a disk file.

The fifth step is to write the main program, using North Star Basic as modified by HDS. Once written, the program is ready to be executed.


```

10 N=POP
20 A=POP
30 FOR J=0 TO N-1:I=J
40   FOR K=J TO N:IF A(J)<A(K) THEN I=K
50   NEXT K
60   @ (0)=A(I);A(I)=A(J);A(J)=@ (0)
70 NEXT J
80 RETURN

```

Table 3 IBASIC Program

```

10 N=100:DIM A(N)
20 FOR J=1 TO N:A(J)=RND(0):NEXT J
30 Z9=CALL(0,[A(0)],N)
40 FOR J=0 TO N:!A(J),:NEXT J
50 END

```

Table 4 Modified Basic Program

Some Compiler Conventions

Before turning to an example, let's examine some details of IBASIC and the compiler conventions. (A more complete discussion is given in the documentation supplied with CDS-HDS). IBASIC supports any variable A through Z and a single array of 16-bit quantities expressed as @(). Note that neither IBASIC nor COMPILER initialize (i.e., zero-out) the variables; this must be done by the programmer.

Communication between the main North Star Basic program and the compiled program segment is done by an extension of the CALL command. Consider the following Basic command as modified by HDS:

```
Z9=CALL(Addr,[A(0)],N)
```

The modified Basic recognizes the variable enclosed in brackets as a reference to the *address* of the variable rather than its value. The same is true for string variables as well. Unlike the original North Star CALL, the modified command can pass as many parameters to the subroutine as desired. Parameters are passed to the routine via the stack, with the exception of the last parameter which is passed in register pair DE. Since the stack is used, care should be taken to POP the correct number of parameters in the subroutine or else it's off to Never-Never Land.

In the sample CALL, Z9 is a dummy variable, while Addr refers to the decimal address of the compiled subroutine. The parameters to be passed are A(0) and N. Since A(0) is in brackets, it is actually the address of A(0) that is being passed, while N is being passed as some numeric quantity.

An Example

Most programmers are familiar with a simple Bubble Sort — a notoriously slow method of sorting data. CDS documentation includes a sample Bubble Sort program. Using IBASIC, the program presented in Table 3 is entered as the first step in the compiler process.

The first two statement lines appear odd at first, but not after you think about it. Since parameters are passed to the compiled subroutine via the stack and the assembly language mnemonic for getting data off the stack is the POP command, the IBASIC POP command seems a logical choice. The only other part of the IBASIC program that appears different is the @() in line 60. This is, however, simply the syntax used by IBASIC for an array. The RETURN statement is necessary because we're treating the loop as a subroutine being CALLED from the main program.

Once the IBASIC program is saved in a disk file, the program is passed through COMPILER, MAKRO and LINKED as explained earlier. Once you've become familiar with the process, it only takes a few minutes to go through these steps. One additional point: when LINKED is run, one of the questions asked is for the LOAD ADDRESS. This is the same address referred to in the CALL statement and is the location in memory where the compiled subroutine will be located. The only difference is that LINKED is asking for the address in hexadecimal, while the CALL wants the address given in decimal. Being inherently lazy, I use address zero for the load address, thus avoiding the necessity of converting

hex to decimal when using the compiler.

Once the object code of LINKED is saved on disk, North Star Basic, as modified by HDS, is loaded and the main program is written. This program appears in Table 4.

Operation of the program is straightforward. Line 20 simply fills the array A(J) with random numbers. CALL in line 30 tells the program: (1) where the compiled subroutine is located in memory (address 0 in decimal); (2) the beginning address of the A(J) array (the terms in brackets); and (3) the number of elements in the array (N). Line 40 prints out the sorted array.

Speed Improvement?

To test the speed improvement of the compiler, I used North Star's unmodified Basic to write a Bubble Sort program in conventional fashion. I might add that the sort program was taken from a college-level Basic programming textbook. It took approximately 66 seconds for the program to run to completion. (Times are approximate since my 3-year-old son hid my stopwatch, but doesn't remember where.) Convinced that this time could be improved upon, I re-worked the algorithm (which was terribly inefficient) and got the run time down to about 32 seconds. Further attempts to improve the speed failed. I felt I had hit the limits imposed by the interpreter.

Then came the moment of truth. With the compiled subroutine in place at memory address zero, I ran the compiled version of the Bubble Sort — 3.5 seconds! A reduction in execution time by a factor of almost 10!

This improvement was typical of most of the programs I ran. One program that involved some integer addition in a nested loop was over 20 times faster. According to the documentation, deeply nested loops may execute up to 50 times faster when in compiled form.

As a convenience to the user, the addition of two lines to the program in Table 4 enables the program to automatically load the compiled object code into memory as part of the program. The two additional lines are:

```
2 P$="OBJECT"
```

```
5 Z9=CALL(X,Y,[P$])
```

The first number (X) of the CALL refers to the address of the routine OVERLOADER that loads the compiled object code, while the second number (Y) is the address where the subroutine is to be loaded and P\$ is the disk file that holds the compiled object code.

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CIRCLE 15

The Negatives?

Having used CDS and HDS for a while, I find there's not much to complain about. The only possible area of improvement that I might suggest is in the documentation. Keeping in mind that I was raised on Heathkit documentation, CDS and HDS documentation comes up a little short. All of the information is there, but it could be organized in a clearer fashion that would take beginners by the hand and walk them through the necessary steps, explaining what you're doing and why along the way. I talked with Mr. Ashley and learned that an addendum to the instructions is now being included with the documentation.

In fairness to the documentation, I read it "backwards" when it arrived. Since the CDS documentation was "on top of" the HDS documentation, I read them in that order. The addendum that has been added now makes it clear that HDS is used before CDS. So much for my criticism.

Some Final Comments

Anyone who programs using North Star Basic and values their time at more than ten cents/hour should give Allen Ashley's CDS-HDS package serious consideration.

And, while you're at it, take a look at his Program Development System (PDS). It contains an assembler-editor, macro assembler, text editor (perfect for use with Dr. Michael Posehn's Textwriter), debug monitor/disassembler, linkage editor and relocating loader. He also has a library of commonly-used subroutines too, so you don't have to re-invent the wheel.

Price for CDS-HDS is \$150, which is pretty inexpensive considering all that you get. The price of PDS is \$99 — equally inexpensive. With any of the packages you also get Mr. Ashley's phone number just in case you need some expert advice. One more point; purchaser's of CDS-HDS can sell any of the programs they develop using the compiler without having to pay a royalty for its use — a real plus for professional programmers.

Whatever your applications, if you're tired of waiting for segments of your program to execute, CDS-HDS could well be your answer. In my estimation, Mr. Ashley's software packages are a noteworthy contribution to the microcomputer field. For further information, write to: Allen Ashley, 395 Sierra Madre Villa, Pasadena, CA 91107.

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! " # \$ % & ' () * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\] ^ _
` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~
BAUDOT Character Set: A B C D E F G H I J K L M N O P Q
R S T U V W X Y Z - ? : * 3 \$ # () , . 9 0 1 4 ! 5 7 ; 2 / 6 8 *

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CIRCLE 16

CIRCLE 17

Reminder Lists

BY W. B. GOLDSMITH, JR.

Of course I have a perfect memory! But I don't like to burden it with trivia. I let my personal computer keep track of many things that I don't want to bother remembering. Many tasks I perform repeatedly lend themselves to list form. With a check list, I can do anything (well, almost). Reminder List helps unburden my organic memory. It's also a fun program that illustrates another way to use the list processing capabilities of Basic. As a bonus, one program can generate a multitude of different lists through the magic of the APPEND command.

Reminder List is a short program that uses only two string variables to generate lists of almost any length. Even if you don't have a recurring need for lists, the techniques of data manipulation used may tickle your imagination and solve other problems you've had in applying your personal computer.

User's Notes

You'll have no trouble using Reminder List. First LOAD the program, then APPEND the DATA statements applicable to the list you need. You need to store only one Reminder List on your tape or disk; each data list can be stored separately. The program will remind you to APPEND your data list.

Once you type RUN, the program will display the items on your list and ask you to input a quantity for each. Input numbers (and zeroes) where appropriate. When you've finished, you'll get a printed list of everything for which you specified a quantity other than zero. You can generate multiple copies of the list as you want them.

As examples, I've included sample runs for a shopping list for Office Supplies, A Luggage Checklist (to keep me from finding myself 3000 miles from home without shirts), and an Auto Supplies shopping list. You may find that my lists don't apply to your personal situation or need to be expanded. No problem; you can come up with any data list that will be helpful and still use Reminder List. You are limited only by your imagination.

Program Notes

As you can see from the Program Listings, Reminder List is very short. Don't let the length fool you — short programs are as useful as long ones. Although I've used fifty-four lines in the root program, you could get by with fewer than thirty by deleting all the REMs and the error checking and printer port option functions.

Reminder List, written in SWTP 8K Basic Version 2.0, is "plain vanilla," and should adapt easily to other Basics with character string variables, one-dimensional matrix capability, APPEND and DATA features.

Let's walk through the program line by line. Statements 10 through 120 are the header, and have no operating function in the program. Lines 130 and 140 print the program name on your control

terminal. You could delete all of these lines without affecting the program sense or function.

Lines 150 through 200 provide an error checking routine to remind you to APPEND your data list. You'll get an error message for your Basic interpreter if you don't APPEND the data when the program tries to execute a READ command, so you could delete these statements without hurting much.

Statements 210 and 220 begin the critical part of the routine. The first DATA item must be the number of items on your list. The "READ X" in 210 gathers this number for the matrix dimensioning statement in line 220 and the "FOR N=1 TO X" statements of lines 280 and 440.

Statements 230, 240 and 250 title your list. The second DATA item is not

Sample Data Statements

```
0900 REM ***** DATA APPENDIX FOR OFFICE SUPPLIES LIST *****
0910 REM
1000 DATA 13,OFFICE SUPPLIES,PENCILS,PENS,REAM PAPER,BOX #6 ENVELOPES
1010 DATA BOX #10 ENVELOPES,BOX 9X12 ENVELOPES,PACKAGE INDEX CARDS
1020 DATA CARBON PAPER,PENCIL ERASERS,GUM ERASERS,CORRECTION FLUID
1030 DATA BOX PAPER CLIPS,BOX STAPLES
```

```
0900 REM ***** DATA APPENDIX FOR TRAVEL PACKING LIST *****
0910 REM
1000 DATA 19,LUGGAGE CHECKLIST,SUITS,SLACKS,JACKETS,SHIRTS,TIES
1010 DATA PAIR SHOES,OVERCOAT,RAINCOAT,T-SHIRTS,SHORTS,PAIR SOCKS
1020 DATA SHAVING KIT,HANDKERCHIEF,AIRLINE TICKETS,BUS TICKETS
1030 DATA TRAIN TICKETS,CAR RENTAL,HOTEL RESERVATIONS,TRAVEL CHECKS
```

```
0900 REM ***** DATA APPENDIX FOR AUTO SUPPLIES SHOPPING LIST *****
0910 REM
1000 DATA 10,AUTO SUPPLIES,SPARK PLUGS,IGNITION POINT SETS,CONDENSER
1010 DATA OIL FILTER,AIR FILTER,FUEL FILTER,WIPER BLADE
1020 DATA POLISH,WASHER FLUID,GALLON ANTI-FREEZE
```

```
0900 REM ***** DATA APPENDIX FOR INCOME TAX RETURN CHECKLIST *****
0910 REM
1000 DATA 29,INCOME TAX CHECKLIST,FORM 1040,SCHEDULE A,SCHEDULE B
1010 DATA SCHEDULE C,SCHEDULE D,SCHEDULE E
1020 DATA SCHEDULE F,SCHEDULE G,SCHEDULE R/RP
1030 DATA SCHEDULE TC,SCHEDULE SE,FORM 2106,FORM 2119
1040 DATA FORM 2210,FORM 2440, FORM 2441, FORM 3468
1050 DATA FORM 3903,FORM 4136,FORM 4255,FORM 4625
1060 DATA FORM 4726,FORM 4684,FORM 4797,FORM 4798
1070 DATA FORM 4972,FORM 5405,FORM 5695,FORM 6251
```


Sample Runs

TRAVEL PACKING LIST

HAVE YOU 'APPENDED' YOUR DATA LIST? NO
THEN I'LL STOP WHILE YOU DO.

READY
#APPEND 1205

READY
#RUN
--- REMINDER LIST ---

HAVE YOU 'APPENDED' YOUR DATA LIST? YES
LUGGAGE CHECKLIST

ENTER THE QUANTITY DESIRED FOR:

SUITS? 3
SLACKS? 1
JACKETS? 0
SHIRTS? 5
TIES? 5
PAIR SHOES? 2
OVERCOAT? 1
RAINCOAT? 0
T-SHIRTS? 5
SHORTS? 5
PAIR SOCKS? 5
SHAVING KIT? 1
HANDKERCHIEF? 5
AIRLINE TICKETS? 1
BUS TICKETS? 0
TRAIN TICKETS? 0
CAR RENTAL? 1
HOTEL RESERVATIONS? 1
TRAVEL CHECKS? 0

WHAT OUTPUT PORT? 3
PRESS 'RETURN' TO PRINT?
LUGGAGE CHECKLIST

3 SUITS
1 SLACKS
5 SHIRTS
5 TIES
2 PAIR SHOES
1 OVERCOAT
5 T-SHIRTS
5 SHORTS
5 PAIR SOCKS
1 SHAVING KIT
5 HANDKERCHIEF
1 AIRLINE TICKETS
1 CAR RENTAL
1 HOTEL RESERVATIONS

ANOTHER COPY? NO

OFFICE SUPPLIES LIST

HAVE YOU 'APPENDED' YOUR DATA LIST? YWS
OFFICE SUPPLIES

ENTER THE QUANTITY DESIRED FOR:

PENCILS? 12
PENS? 0
REAM PAPER? 1
BOX #6 ENVELOPES? 0
BOX #10 ENVELOPES? 1
BOX 9X12 ENVELOPES? 0
PACKAGE INDEX CARDS? 0
CARBON PAPER? 1
PENCIL ERASERS? 6
GUM ERASERS? 0
CORRECTION FLUID? 12
BOX PAPER CLIPS? 1
BOX STAPLES? 0

WHAT OUTPUT PORT? 3
PRESS 'RETURN' TO PRINT?
OFFICE SUPPLIES

12 PENCILS
1 REAM PAPER
1 BOX #10 ENVELOPES
1 CARBON PAPER
6 PENCIL ERASERS
12 CORRECTION FLUID
1 BOX PAPER CLIPS

ANOTHER COPY? NO

INCOME TAX CHECKLIST

HAVE YOU 'APPENDED' YOUR DATA LIST? YES

INCOME TAX CHECKLIST

ENTER THE QUANTITY DESIRED FOR:

FORM 1040? 1
SCHEDULE A? 1
SCHEDULE B? 1
SCHEDULE C? 2
SCHEDULE D? 1
SCHEDULE E? 0
SCHEDULE F? 0
SCHEDULE G? 1
SCHEDULE R/RP? 0
SCHEDULE TC? 1
SCHEDULE SE? 0
FORM 2106? 1
FORM 2119? 0
FORM 2210? 0
FORM 2440? 0
FORM 2441? 0
FORM 3468? 0
FORM 3903? 0
FORM 4136? 0
FORM 4255? 0
FORM 4625? 0
FORM 4726? 0
FORM 4684? 0
FORM 4797? 0
FORM 4798? 0
FORM 4972? 0
FORM 5405? 0
FORM 5695? 0
FORM 6251? 1

WHAT OUTPUT PORT? 3
PRESS 'RETURN' TO PRINT?

INCOME TAX CHECKLIST

1 FORM 1040
1 SCHEDULE A
1 SCHEDULE B
2 SCHEDULE C
1 SCHEDULE D
1 SCHEDULE G
1 SCHEDULE TC
1 FORM 2106
1 FORM 6251

ANOTHER COPY? NO

AUTO SUPPLIES SHOPPING LIST

HAVE YOU 'APPENDED' YOUR DATA LIST? NO
THEN I'LL STOP WHILE YOU DO.

READY
#APPEND 1206

READY
#RUN

Continued

Continued

--- REMINDER LIST ---

HAVE YOU 'APPENDED' YOUR DATA LIST? YUP
AUTO SUPPLIES

ENTER THE QUANTITY DESIRED FOR:

SPARK PLUGS? 8
IGNITION POINT SETS? 1
CONDENSER? 1
OIL FILTER? 1
AIR FILTER? 1
FUEL FILTER? 0
WIPER BLADE? 0
POLISH? 0
WASHER FLUID? 1
GALLON ANTI-FREEZE? 0

WHAT OUTPUT PORT? 3

PRESS 'RETURN' TO PRINT?

AUTO SUPPLIES

8 SPARK PLUGS
1 IGNITION POINT SETS
1 CONDENSER
1 OIL FILTER
1 AIR FILTER
1 WASHER FLUID

ANOTHER COPY? NOPE

part of your list, but is critical because the program is structured to look for the title in the second data position.

Lines 260 and 270 provide the general prompt for your user. Although you could delete this prompt to save a little memory, the memory saving is not worth the possible user confusion.

The data gathering and input routine is contained in lines 280 through 330. Since we'll use the same DATA list to manage the printout, the only input worth spending memory on is the quantities. The item quantities are saved in

matrix A(N).

The "RESTORE" command in line 340 resets the data pointer to the beginning of the DATA list and allows us to cycle through the list again during the print phase.

Lines 350 through 390 select the output device. SWTP Basic allows input/output port selection with a "PORT=" command. If your Basic uses a different format for selecting the printer, you'll need to change these lines to conform with your specific requirements. The "PRESS 'RETURN' TO PRINT" input gives me a last chance to turn on my TTY (my system output printer) and insure that the paper is positioned properly. (I've been embarrassed and frustrated too many times by trying to output to a de-energized printer.)

Line 400 is critical, but doesn't do anything for the output. (Huh?) Since we can dimension the matrix only once — and we did that in line 220 — we don't need the number of items in the data list repeated. The first item in the data list is the number of items, and we must READ it to move the data pointer along. Without the "READ X", our entire printout would be skewed and useless.

"READ A\$", "PRINT A\$", and "PRINT" in lines 410, 420 and 430 put the title of the list on the printout, and move the data pointer to the list items.

Statements 440 through 490 provide the printout "FOR...NEXT" routine to match the quantities entered earlier with the list items. In the output routine, line 460 suppresses all entries for which the quantity is zero.

On my SWTP 6800, the control terminal is located at Port 1. Line 500 transfers command back to the control terminal to keep the "ANOTHER COPY?" prompt off the output sheet. Again, you'll have to make adjustments for your Basic's requirements.

The routine in lines 510 through 540 allows you to get another copy printed if your printer, like mine, only turns out one copy at a time. If you're sure you'll want only one copy of any list ever, delete 510 through 540 to save key-punch time and program memory.

Data Lists

You can make any data list that will be useful to you. The only constraints for proper program execution are that the first item in your DATA statements must be the number of items on your list; and, the second item in the DATA statements must be the title (which is not counted as an item). A data list can be as short as you want, or as long as your program memory will allow.

Reminder List is a handy program that will generate lists to your heart's content. It's a small program with a lot of uses. You can make up laundry lists, billing reminders, real estate escrow check lists, airplane pre-flight check lists and hundreds of others.

The data manipulation techniques featured in the program are useful anywhere you need to repeat items in a print out. The APPEND command in your Basic interpreter may be one that doesn't get used often, and I hope Reminder List has alerted you to some additional computer power at your fingertips. □

Program Listing

```

0010 REM *****
0020 REM **
0030 REM ** REMINDER LIST **
0040 REM **
0050 REM *****
0060 REM
0070 REM * COPYRIGHT 1980 BY *
0080 REM * W.B. GOLDSMITH, JR. *
0090 REM * LAKEWOOD, CA 90712 *
0100 REM *****
0110 REM * ALL RIGHTS RESERVED *
0120 REM *****
0130 PRINT " --- REMINDER LIST ---"
0140 PRINT
0150 INPUT "HAVE YOU 'APPENDED' YOUR DATA LIST",B$
0160 IF LEFT$(B$,1)="Y" THEN 200
0170 PRINT
0180 PRINT "THEN I'LL STOP WHILE YOU DO."
0190 END
0200 PRINT
0210 READ X
0220 DIM A(X)
0230 READ A$
0240 PRINT A$
0250 PRINT
0260 PRINT "ENTER THE QUANTITY DESIRED FOR:"
0270 PRINT
0280 FOR N=1 TO X
0290 READ A$
0300 PRINT A$;
0310 INPUT A(N)
0320 NEXT N
0330 PRINT
0340 RESTORE
0350 INPUT "WHAT OUTPUT PORT",P
0360 PRINT
0370 INPUT "PRESS 'RETURN' TO PRINT",B$
0380 PORT= P
0390 PRINT
0400 READ X
0410 READ A$
0420 PRINT A$
0430 PRINT
0440 FOR N=1 TO X
0450 READ A$
0460 IF A(N)=0 THEN 480
0470 PRINT A(N);TAB(5);A$
0480 NEXT N
0490 PRINT
0500 PORT= 1
0510 INPUT "ANOTHER COPY",B$
0520 IF LEFT$(B$,1)<>"Y" THEN END
0530 RESTORE
0540 GOTO 370

```


DRAPERY ESTIMATING

—BY CLINT HENTZ—

Here's a program written specifically for the drapery business — drapery departments or stores selling custom made draperies; drapery workrooms or a manufacturer of custom draperies; persons contemplating purchasing or making their own draperies; and/or apprentices in the drapery trade with an interest in microcomputers.

In a commercial environment the program should save time in estimating the various drapery needs of customers. It will also provide assurance that each customer's order will be figured by a standardized procedure, thereby eliminating the embarrassment created when two salespersons give different estimates to the same customer for the same job.

The savings in time should end up on the bottom line of the P & L as a definite plus. If you run an average of twelve detailed estimates and work tickets per

day and pay an overall estimating rate of \$9 per hour for four hours of estimating per day, you can pay off a 32K TRS-80 and printer in seven months. The \$9 rate includes salary, vacations, coffee breaks and benefits.

I feel these savings are conservative. Using a computer and an estimating program similar to the one given here could save more than 50% of the time it takes to prepare a detailed estimate manually. Of course, you as owner or manager determine the actual dollar savings through effective use of the time made available by the computer. The savings in time can be converted into dollars through reduction in staff or realigning job functions.

If you intend to make your own draperies, you should run the program before you shop for the fabrics. Write down the questions which appear on the CRT. When you're in the store looking at the fabrics and linings, write down the information you need to answer the questions. Also, obtain data on several different fabrics while in the store. When you get home you can make several cost comparisons, selecting the fabric which meets your budget.

Program Operation

The program begins by asking questions needed to produce an effective drapery estimate. In several cases the program checks your answer and comments about it if there seems to be a problem with the answer. This technique helps keep the person running the program on the right track.

After examining the answers to the questions the program goes through the necessary estimating procedures to provide a hard copy of the detailed estimate and related work tickets.

I wrote the program on a 48K TRS-80 with printer and saved the program on diskette. The diskette loads much faster and is more reliable than the Radio Shack cassette. However, the program should fit in and run on a 16K

Figure 1

You can make estimates from any combination of:

- Traverse draperies
- Straight hanging draperies
- Valances
- Lined
- Unlined
- Standard lining
- Room darkening lining
- Insulated lining
- White lining
- Cream color lining
- Ecu Color lining
- Cost of lining
- Plain material
- Pattern material
- Cost of material
- Double fullness
- Triple fullness
- Number of rods
- Price of rods
- Labor to make
- Labor to install in wood
- Labor to install in plaster
- Labor to install on rods up
- Labor to deliver only

TRS-80 with printer and recorder. You do not need the disk system for the program.

There are very few multi-statement lines. These are separated by a colon (:) on a TRS-80 Level 2 computer. LPRINT is used to send the information to the printer. LPRINT"" is used to produce a blank line on the hard copy. Note that since consumers purchase fabrics in full yards and fractions of yards, the program produces the estimate in these everyday trade terms.

I included quite a few REM statements in the program to make it easy to customize for a specific drapery company. In addition to the REM statements, I have included a list (Figure 2) of the line numbers with comments on changes you should make.

Although there seem to be quite a few changes, you must remember the program handles many different combinations of traverse draperies, straight hanging draperies and valances (Figure 1). □

Figure 2

- 540 Insert the widths of material you use or sell if other than 36 to 52 inches wide.
- 590 -
- 600 If your pattern repeats run larger than 36 inches, insert the largest size.
- 640 Program has set \$35 per yd. as a high price; change to reflect your top price.
- 1130 Insert your types of lining and change lines 1450-1460 and 1460 to conform.
- 1170 If you changed lines 1130-1140 and 1150, alter 1170 to conform.
- 1420 Double fullness is figured as pleating 48 in. material down to 24 in.; triple is 48 in. down to 16 in.
- 1450 Insert your lining prices for your types of lining; example program has standard lining as \$3 per yd.
- 1500 Change hem and heading allowance to your specifications; program has 8 in. for lined and 12 in. for unlined.
- 1880 Program has the cost of rods at 20 cents per inch; check your price per inch and change accordingly.
- 1950 Change the \$25 for lined and the \$15 for unlined to your rates (prices are per width); valances same price.
- 2000 Change installation charges to your rate per inch; example program has installation in wood at 10 cents per inch.
- 2220 Change next 6 lines to conform to your lining terminology; then see line 1130.
- 2890 We use \$25 as the minimum rate; insert your rate, then change line 3370 to conform.
- 3040 You may want to change wording; as it is, the statement is true but may be confusing to some.
- 3820 The next 9 lines list specifications for making draperies; change to conform to your specifications; be sure to alter program to reflect changes.

Sample Run

DATE 10/26/1980
 CUSTOMER MRS JUNE R. HENTZ
 STREET ADDRESS 1980 AMERICA AVENUE
 CITY & STATE ST. LOUIS MO.
 ZIP CODE 63199
 TELEPHONE # 123 4567

WORK TICKET # 1 OF 2

LOCATION BED ROOM #2

--- CUTTING INFORMATION ---

10 LENGTHS OF PATTERN HORIZON 456 - COLOR SUN GOLD - 110 INCHES LONG.
 10 LENGTHS OF ROOM DARKENING LINING - COLOR CREAM - 88.5 INCHES LONG.

THIS WORK TICKET FOR TRAVERSE STYLE DRAPERIES

NUMBER PAIR(S) THIS SIZE 2

FINISHED LENGTH	TO FIT ROD	FULLNESS	
86.50	96	DOUBLE	
YARDS FABRIC	PRICE YD.	COST OF FABRIC	PATTERN REPEAT
30 5/8	12.95	396.594	22.00

(... YARDAGES ARE FOR THIS TICKET ONLY ...)

YDS. LINING	PRICE YD.	COST OF LINING
24 5/8	4.50	110.813
NUMBER OF RODS	SIZE	COST OF ROD/RODS
2	96.00	17.28

CUT AND SEW
 YES

COST TO MAKE
 120.00

INSTALL/DELIVER
 PLASTER

COST TO INSTALL/DELIVER (MIN. \$25 TOTAL)
 38.40

COST FOR THE 2 TRAVERSE DRAPERY/DRAPERIES ON THIS WORK TICKET # 1
 \$683.09 (LESS APPLICABLE TAX)

TOTAL ESTIMATE (INCLUDING SALES TAX) FOR THE BED ROOM #2

IN PREPARING THIS ESTIMATE THE COMPUTER RECOGNIZED THAT WHEN COMBINING IDENTICAL YARDAGES FROM MULTIPLE TICKETS SLIGHTLY LESS TOTAL YARDAGE MAY BE REQUIRED. THEREFORE, THE FOLLOWING TOTAL YARDAGE FIGURE MAY BE SLIGHTLY LESS THAN SHOWN IN THE ABOVE INDIVIDUAL YARDAGE FIGURES.

TOTAL YARDS OF MATERIAL	35 1/2 @	\$12.95 PER YARD =	459.73
		\$4.50 PER YARD =	127.69
			34.74

WORK TICKET # 2 OF 2

LOCATION BED ROOM #2

--- CUTTING INFORMATION ---

RIZON 456 - COLOR SUN GOLD - 22 INCHES LONG.
 LING LINING - COLOR CREAM - 17 INCHES LONG.

CE/S

DD FULLNESS
 DOUBLE

COST OF FABRIC	PATTERN REPEAT
64.750	22.00

TICKET ONLY ...)

COST OF LINING
17.438

COST OF ROD/RODS
17.46

ST TO MAKE
 96.00

TO INSTALL/DELIVER (MIN. \$25 TOTAL)
 38.00

COST FOR THIS WORK TICKET # 2
 \$234.45 (LESS APPLICABLE TAX)

Program Listing

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10 REM COMMERCIAL DRAPERY ESTIMATING.
20 REM ALSO APPLICABLE FOR THE HOME OWNER
30 REM CLINT HENTZ
40 REM ST. LOUIS MISSOURI
50 CLEAR 1000
60 PRINT"THIS DRAPERY ORDER FOR:"
70 INPUT"CUSTOMER'S NAME";N1$
80 INPUT"STREET ADDRESS";A1$
90 INPUT"CITY & STATE (NO COMMAS)";C1$
100 INPUT"ZIP CODE";Z1$
110 INPUT"TELEPHONE NUMBER";T1$
120 INPUT"TO-DAYS DATE EX 09/20/1980";DD$
130 PRINT:PRINT:PRINT
140 PRINT"THIS PROGRAM WILL ASK SPECIFIC QUESTIONS NECESSARY"
150 PRINT"TO PREPARE A DRAPERY ESTIMATE & PROPER WORK TICKETS.":PRINT
160 PRINT" *** IMPORTANT ***"
170 PRINT"ONE QUESTION WILL ASK HOW MANY DIFFERENT SIZES OR STYLES"
180 PRINT"ARE REQUIRED FOR THE ROOM IN QUESTION."
190 PRINT"DO NOT COMBINE LINED & UNLINED IN THE SAME SIZE GROUP."
200 PRINT"EX... IF YOU HAVE 1 PR. LINED & 1 PR. UNLINED... AND BOTH"
210 PRINT"OF THE SAME SIZE... YOU WILL INSERT A 2 IN ANSWER TO"
220 PRINT"THE QUESTION... HOW MANY DIFFERENT SIZES OR STYLES IN THE ROOM?"
230 PRINT"DOING IT THIS WAY, A WORK TICKET & ESTIMATE WILL BE PREPARED"
240 PRINT"FOR EACH ITEM."
250 PRINT:PRINT"TYPE IN LETTER C AND ENTER TO CONTINUE.":INPUTCC$
260 IF CC$="C" GOTO 270
270 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
280 PRINT"WHERE QUESTIONS ASK FOR AMOUNTS OR SIZES... ANSWER IN NUMBERS."
290 PRINT"FOR FRACTION OF INCH USE ...."
300 PRINT"1/8 = .125"
310 PRINT"1/4 = .25"
320 PRINT"1/2 = .50"
330 PRINT"3/4 = .75"
340 PRINT"DO NOT SPELL OUT NUMBERS"
350 PRINT"EXAMPLE 2 1/4 INCHES IS ENTERED AS 2.25 NO INCH MARKS"
360 PRINT:PRINT:PRINT
370 PRINT"FOR WHICH ROOM ARE THESE DRAPERIES?"
380 PRINT"EXAMPLE... BED ROOM #2"
390 PRINT"EXAMPLE... LIVING ROOM"
400 INPUT R$:PRINT:PRINT
410 PRINT"HOW MANY ** DIFFERENT SIZES OR STYLES ** ARE REQUIRED."
420 PRINT"IN THE ";R$:
430 PRINT"DON'T FORGET ABOUT THE LINED & UNLINED"
440 PRINT"THEY MUST BE CONSIDERED AS SEPERATE STYLES."
450 INPUT N8:PRINT:PRINT
460 INPUT"PATTERN NAME OR NUMBER OF THE MATERIAL";P$:PRINT
470 INPUT"COLOR OF MATERIAL";C$:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
480 PRINT"REMEMBER TO ANSWER ALL QUESTIONS RELATIVE TO SIZES"
490 PRINT"IN INCHES ONLY.. DO NOT USE FEET & INCHES.":PRINT
500 PRINT"EXAMPLE 4 FEET 2 INCHES IS ENTERED AS 50 .. DO NOT USE INCH MARKS"
510 PRINT"-----"
520 PRINT:PRINT
530 INPUT"WIDTH OF THE MATERIAL .. IN INCHES";W:PRINT
540 IF (W<35)OR(W>52)THEN PRINT"**** CHECK THE WIDTH OF THE MATERIAL YOU
ENTERED ****":GOTO530
550 PRINT"WHAT IS THE PATTERN REPEAT IN THE MATERIAL.."
560 PRINT"REMEMBER TO RECORD YOUR ANSWER ONLY IN INCHES."
570 PRINT"IF PLAIN MATERIAL IS BEING USED, TYPE IN 0"
580 INPUT P1:PRINT
590 IF P1>36PRINT P1;"INCHES IS A LARGE REPEAT ARE YOU SURE IT IS CORRECT.
INSERT THE REPEAT SIZE AGAIN.":PRINT
600 IF P1>36PRINT" I CHECKED THE SIZE & THE CORRECT PATTERN REPEAT IS"
:INPUT P1
610 PRINT"PRICE PER YARD OF THE FABRIC ....."
620 PRINT"EXAMPLE ... $8.95 PER YARD IS ENTERED AS 8.95 ( NO $ SIGN.)"
630 INPUT M:PRINT

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RUN #2 EXAMPLE OF LINED & UNLINED MIXED ON SAME ESTIMATE

DATE 10/26/1980
 CUSTOMER MRS. C. E. HENTZ
 STREET ADDRESS 2000 MARS
 CITY & STATE ST. LOUIS MO.
 ZIP CODE 64555
 TELEPHONE # 987 6543

WORK TICKET # 2 OF 2

LOCATION LIVING ROOM

--- CUTTING INFORMATION ---

8 LENGTHS OF PATTERN ALICIA - COLOR BROWN #28 - 100 INCHES LONG.

8 LENGTHS OF INSULATED LINING -

THIS WORK TICKET FOR TRAVERSE STYLE

NUMBER PAIR(S) THIS SIZE

FINISHED LENGTH	TO FIT ROD
91.00	84

YARDS FABRIC	PRICE YD.
22 1/4	10.75

(... YARDAGES ARE FOR THIS TICKET ONLY ...)

YDS. LINING	PRICE YD.
20 3/4	6.00

NUMBER OF RODS	SIZE
0	0.00

CUT AND SEW YES

INSTALL/DELIVER PLASTER

COST FOR THE 1 TRAVERSE DRAPERY \$476.40

WORK TICKET # 1 OF 2

LOCATION LIVING ROOM

--- CUTTING INFORMATION ---

11 LENGTHS OF PATTERN ALICIA - COLOR BROWN #28 - 100

NO LINING REQUIRED

THIS WORK TICKET FOR TRAVERSE STYLE DRAPERIES

NUMBER PAIR(S) THIS SIZE 1

FINISHED LENGTH	TO FIT ROD	FULLNESS
76.00	120	TRIPLE

YARDS FABRIC	PRICE YD.	COST OF FABRIC	PATTE
30 5/8	10.75	329.219	

(... YARDAGES ARE FOR THIS TICKET ONLY ...)

YDS. LINING	PRICE YD.	COST OF LINING
UNLINED		

NUMBER OF RODS	SIZE	COST OF ROD/RODS
1	120.00	10.00

CUT AND SEW YES

INSTALL/DELIVER WOOD

COST FOR THE 1 TRAVERSE DRAPERY/DRAPERIES ON THIS WORK TICKET # 1 \$462.02 (LESS APPLICABLE TAX)

TOTAL ESTIMATE (INCLUDING SALES TAX) FOR THE LIVING ROOM

IN PREPARING THIS ESTIMATE THE COMPUTER RECOGNIZED THAT WHEN COMBINING IDENTICAL YARDAGES FROM MULTIPLE TICKETS SLIGHTLY LESS TOTAL YARDAGE MAY BE REQUIRED. THEREFORE, THE FOLLOWING TOTAL YARDAGE FIGURE MAY BE SLIGHTLY LESS THAN SHOWN IN THE ABOVE INDIVIDUAL YARDAGE FIGURES.

TOTAL YARDS OF MATERIAL	52 7/8 @	\$10.75 PER YARD	= 568.41
TOTAL YARDS OF LINING	20 3/4 @	\$6.00 PER YARD	= 124.50
DRAPERY RODS	1		10.00
SUB TOTAL			702.91

APPLICABLE SALES TAX	.04625	32.55
TOTAL OF MERCHANDISE + SALES TAX		736.25

LABOR TO MAKE		206.00
LABOR TO DELIVER OR INSTALL (MINIMUM \$25.00)		28.00

GRAND TOTAL \$971.05

THE ABOVE FIGURES WERE BASED ON :
 MATCHING PATTERNS IF APPLICABLE.
 THE DRAPERIES OR VALANCES HAVING 5 INCH BOTTOM HEMS
 WITH WEIGHTS AT SEAMS AND CORNERS.
 AND 5 INCHES BEING ALLOWED FOR HEADINGS.
 ALL ITEMS TO HAVE FRONT AND BACK SIDE HEMS SEWEN BY HAND.
 BOTTOM HEMS TO BE BLIND STITCHED BY MACHINE.
 JOINING SEAMS TO BE MACHINE OVERLOCKED.
 PINCH PLEATED ITEMS TO HAVE ROD HOOKS SEWEN ON BY MACHINE.

Program Listing

(cont'd)

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640 IF M35PRINT"THAT IS EXPENSIVE. RECHECK. THEN ENTER THE PRICE PER
    YARD AGAIN":INPUT M
650 PRINT"FULLNESS DESIRED ....."
660 PRINT"INSERT THE LETTER D FOR DOUBLE FULLNESS"
670 PRINT"INSERT THE LETTER T FOR TRIPLE FULLNESS"
680 INPUT F$:PRINT
690 IF (F$<"D") AND (F$<"T") THEN PRINT"INCORRECT ENTRY... INSERT
    ...D... OR... T":GOTO 650
700 IF (M35)OR(M58)THEN PRINT"THE SIZE YOU INSERTED IS UNUSUAL.
    RECHECK AND ENTER SIZE AGAIN.":INPUTW
710 INPUT"ARE WE TO MAKE THE DRAPERIES/VALANCES... Y=YES N=NO"
    :S$:PRINT
720 IF (S$<"Y")AND(S$<"N") THEN PRINT"INCORRECT RESPONSE
    ENTER Y OR N":GOTO 710
730 FOR I= 1 TO N8:IF I>1 PRINT"NOW FOR THE NEXT SIZE":PRINT
740 PRINT:PRINT
750 PRINT"AT THE START OF THIS ESTIMATE ....."
760 PRINT"YOU ENTERED HOW MANY - DIFFERENT SIZES OR STYLES -"
770 PRINT"WERE REQUIRED IN THE ";R$
780 PRINT"THIS TIME HOW MANY ITEMS WILL BE OF THE SAME SIZE"
790 PRINT"AND OF THE SAME STYLE IN THE ";R$
800 PRINT"YOUR ANSWER MUST BE ONLY FOR IDENTICAL ITEMS"
810 PRINT"OF THE SAME SIZE..."
820 PRINT"YOU WILL BE GIVEN ANOTHER OPPORTUNITY - LATER ON -"
830 PRINT"TO ENTER THE OTHER SIZES/STYLES IF YOU ENTERED"
840 PRINT"MORE THAN 1 TO THE QUESTION ....."
850 PRINT"HOW MANY - DIFFERENT SIZES & STYLES - ARE REQUIRED"
860 PRINT
870 PRINT"NOW ENTER NUMBER OF - S A M E - SIZE & STYLE."
880 INPUT N(I):PRINT
890 PRINT"STYLE DRAPERIES/VALANCES TO BE FIGURED..."
900 PRINT"ENTER LETTER T FOR TRAVERSE STYLE."
910 PRINT"ENTER LETTER S FOR STRAIGHT HANGING."
920 PRINT"ENTER LETTER V FOR VALANCE."
930 INPUT K$(I):PRINT
940 IF (K$(I)<"T")AND(K$(I)<"S")AND(K$(I)<"V")THEN PRINT"INCORRECT
    RESPONSE INSERT LETTER T,S OR V." GOTO 930
950 IF K$(I)="S" THEN K$(I)="STRAIGHT HANGING DRAPERIES"
960 IF K$(I)="V" THEN K$(I)="VALANCE/S"
970 IF K$(I)="T" THEN K$(I)="TRAVERSE DRAPERY/DRAPERIES"
980 PRINT:PRINT
990 PRINT"HOW MANY RODS ARE REQUIRED FOR THESE/THIS ";N(I); "ITEM/S"
1000 PRINT"THERE MAY BE SOME EXISTING RODS AT THE WINDOW/S."
1010 PRINT"THEFORE, YOU MAY NOT NEED A ROD FOR EACH ITEM."
1020 PRINT"ENTER 0 IF NONE IS REQUIRED."
1030 INPUT F7(I):PRINT
1040 IF F7(I)>N(I)THEN PRINT"INCORRECT RESPONSE YOU ENTERED MORE RODS
    THAN REQUIRED.":GOTO 1030
1050 IF F7(I)=0 GOTO 1080
1060 PRINT"WHAT SIZE ROD/RODS IS/ARE REQUIRED FOR THE ";K$(I)
1070 INPUT R2(I):PRINT:PRINT
1080 PRINT"IF LINING IS REQUIRED, ENTER Y"
1090 PRINT"IF NOT REQUIRED, ENTER N":INPUT L1$(I):PRINT
1100 IF (L1$(I)<"Y")AND(L1$(I)<"N")THEN PRINT"INCORRECT RESPONSE.
    ENTER LETTER Y OR N":GOTO 1080
1110 IF L1$(I)="N" GOTO 1200
1120 PRINT"TYPE OF LINING TO BE USED."
1130 PRINT"S = STANDARD."
1140 PRINT"R = ROOM DARKENING."
1150 PRINT"I = INSULATED."
1160 INPUT L2$(I):PRINT
1170 IF (L2$(I)<"S")AND(L2$(I)<"R")AND(L2$(I)<"I")THEN PRINT"
    INCORRECT RESPONSE INSERT ONLY A LETTER S,R OR I.":GOTO 1160
1180 INPUT"COLOR OF LINING TO BE USED. W = WHITE.. C = CREAM
    .. E = ECRU":L3$(I):PRINT:PRINT
1190 IF (L3$(I)<"W")AND(L3$(I)<"C")AND(L3$(I)<"E")THEN PRINT
    "INCORRECT RESPONSE INSERT ONLY A W,C OR E.":GOTO 1180
1200 PRINT"WHAT IS THE FINISHED LENGTH OF THIS/THESE ";K$(I)
1210 INPUT L(I)
1220 IF L(I)>120 THEN PRINT"RECHECK TO BE SURE ";L(I); " IS
    CORRECT":GOTO 1200
1230 IF K$(I)="S"THEN PRINT"GIVE OVERALL PLEATED SIZE FOR THE PAIR
    INCLUDING RETURN":INPUTW(I):PRINT:GOTO 1260
1240 IF K$(I)="T" GOTO 1250
1250 PRINT"THIS GROUP OF ";K$(I); " TO FIT A ROD ... INCHES WIDE"
    :INPUTW(I):PRINT:PRINT
1260 PRINT"INSTALLATION ....."
1270 PRINT"IF RODS ARE TO GO INTO WOOD, TYPE IN W"
1280 PRINT"IF RODS ARE TO GO INTO PLASTER, TYPE IN P"
1290 PRINT"IF SOME ARE TO GO INTO WOOD AND SOME INTO PLASTER,
    TYPE IN P"

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1300 PRINT"IF DRAPERIES ARE TO BE INSTALLED ON EXISTING RODS TYPE IN D"
1310 PRINT"IF ORDER IS TO BE DELIVERED ONLY.. NO INSTALLATION.. TYPE IN M1"
    :INPUT I$(I):PRINT
1320 IF (I$(I)<"W")AND(I$(I)<"P")AND(I$(I)<"D")AND(I$(I)<"M1")THEN PRINT
    "INCORRECT RESPONSE INSERT W..P..D.. OR M1":GOTO 1
1330 PRINT
1340 PRINT"SEWING INSTRUCTIONS ....."
1350 PRINT"1 = MAKE INTO A PANEL"
1360 PRINT"2 = MAKE INTO A PAIR"
1370 PRINT"3 = MAKE INTO A VALANCE"
1380 PRINT"ENTER 1, 2 OR 3":INPUT S(I)
1390 PRINT"-----"
1400 IF (S(I)<1)OR(S(I)>3)THEN PRINT"INCORRECT RESPONSE... INSERT 1, 2 OR 3"
    :PRINT:PRINT:GOTO 1340
1410 REM W/2 & W/3 FIGURES FULLNESS
1420 IF F$="D" THEN F1=W/2 ELSE F1=W/3
1430 IF F$="D" THEN D$="DOUBLE" ELSE D$="TRIPLE"
1440 REM M1 = PRICE OF LINING
1450 IF L2$(I)="S" THEN M1=3.00
1460 IF L2$(I)="R" THEN M1=4.50
1470 IF L2$(I)="I" THEN M1=6.00
1480 REM L(I)+8=INCHES OVER FINISHED LENGTH FOR LINED DRAPERY. (MEM &
    HEADING ALLOWANCE"
1490 REM L(I)+12=INCHES OVER FINISHED LENGTH FOR UNLINED DRAPERY. (MEM
    & HEADING ALLOWANCE.)"
1500 IF L1$(I)="Y" THEN LL=L(I)+8 ELSE LL=L(I)+12
1510 REM W4(I)= NUMBER WIDTHS OF MATERIAL FOR ONE PAIR
1520 IF (K$(I)="S")OR(K$(I)="V") THEN W4(I)=INT((M1(I)/F1+.9):GOTO 1550
1530 IF K$(I)="T" GOTO 1540
1540 W4(I)=INT((M1(I)+12)/F1+.9)
1550 REM NEXT LINE SEPARATES PATTERN MATERIAL FROM PLAIN
1560 IF P1 > 0 THEN 1580 ELSE 1760
1570 REM L4= NUMBER OF REPEATS PER LENGTH
1580 L4=INT(LL/P1+.95)
1590 L5(I)=L4*P1
1600 REM L6(I)= TOTAL YARDS OF PATTERN MATERIAL
1610 L6(I)=(W4(I)*L5(I))/36)*N(I)
1620 T1=T1+L6(I)
1630 REM L7(I)= TOTAL DOLLARS OF PATTERN MATERIAL
1640 L7(I)=L6(I)*M1
1650 T2=T2+L7(I)
1660 LL=L(I)+2
1670 REM A1(I)=TOTAL YARDS OF LINING REQUIRED
1680 IF L1$(I)="N" THEN 1700
1690 A1(I)=(LL*W4(I))/36)*N(I)
1700 T3=T3+A1(I)
1710 REM A2(I)= TOTAL COST OF LINING
1720 A2(I)=A1(I)*M1
1730 T4=T4+A2(I)
1740 IF P1>0 GOTO 1860
1750 REM L6,L7,A1 & A2 .. AS ABOVE EXCEPT FIGURES PLAIN MATERIAL
1760 L6(I)=(LL*W4(I))/36)*N(I)
1770 T1=T1+L6(I)
1780 L7(I)=L6(I)*M1
1790 L5(I)=LL
1800 T2=T2+L7(I)
1810 LL=L(I)+2
1820 A1(I)=(LL*W4(I))/36)*N(I)
1830 T3=T3+A1(I)
1840 A2(I)=A1(I)*M1
1850 T4=T4+A2(I)
1860 GOTO 1870
1870 REM R9= PRICE OF TRAVERSE ROD PER INCH
1880 IF K$(I)="S" THEN R8(I)=R2(I)*.20*F7(I):GOTO 1920
1890 IF F7(I)>0 THEN R9=.09
1900 R8(I)=M1(I)*R9*F7(I)
1910 REM R8(I)=COST OF ROD
1920 T5=T5+R7(I)
1930 T6=T6+R8(I)
1940 REM M8=LABOR COST TO CUT & SEW.. 12.00 FOR LINED.. 10.00 FOR UNLINED
1950 IF L1$(I)="Y" THEN M8=12.00 ELSE M8=10.00
1960 M9(I)=(W4(I)*M8)*N(I)
1970 IF S$="N" THEN M9(I)=0
1980 T7=T7+M9(I)
1990 REM I4= COST TO INSTALL.. EXAMPLE .10 PER INCH TO INSTALL ON WOOD SURFACE.
2000 IF I$(I)="W" THEN I4=.10
2010 IF I$(I)="P" THEN I4=.20
2020 IF I$(I)="D" THEN I4=.05
2030 IF I$(I)="N" THEN I4=0
2040 K(I)=I4*W4(I)*N(I)
2050 IF I$(I)="W" THEN I8(I)="WOOD"
2060 IF I$(I)="P" THEN I8(I)="PLASTER"
2070 IF I$(I)="D" THEN I8(I)="DRAPERY ONLY"
2080 IF I$(I)="M1" THEN I8(I)="DELIVER ONLY"
2090 T8=T8+K(I)
2100 PRINT:PRINT:NEXT
2110 LPRINT"DATE";DD$
2120 LPRINT"CUSTOMER";M1$
2130 LPRINT"STREET ADDRESS";A1$

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2140 LPRINT"CITY & STATE ";C1$
2150 LPRINT"ZIP CODE ";Z1$
2160 LPRINT"TELEPHONE # ";T1$
2170 LPRINT"
2180 LPRINT"=====
2190 LPRINT"
2200 FOR I=1 TO N8
2210 REM L2$=VARIOUS LININGS USED IN MAKING DRAPERIES
2220 IF L2$(I)="S" THEN L2$(I)="STANDARD"
2230 IF L2$(I)="R" THEN L2$(I)="ROOM DARKENING"
2240 IF L2$(I)="I" THEN L2$(I)="INSULATED"
2250 IF L3$(I)="W" THEN L3$(I)="WHITE"
2260 IF L3$(I)="C" THEN L3$(I)="CREAM"
2270 IF L3$(I)="E" THEN L3$(I)="ECRU"
2280 IF L1$(I)="N" THEN L2$(I)="UNLINED"
2290 LPRINT"
2300 LPRINT TAB(23)"WORK TICKET # ";I; " OF ";N8
2310 LPRINT"
2320 LPRINT TAB(24)"LOCATION ";R$
2330 LPRINT"
2340 LPRINT TAB(20)"--- CUTTING INFORMATION ---"
2350 LPRINT"
2360 LPRINT W4(I)*N(I); "LENGTHS OF PATTERN ";P$; " - COLOR ";C$; " -";L5(I);
      " INCHES LONG."
2370 LPRINT"
2380 IF L1$(I)="N" GOTO 2390 ELSE 2400
2390 LPRINT"NO LINING REQUIRED"; GOTO 2410
2400 LPRINT W4(I)*N(I); "LENGTHS OF ";L2$(I); " LINING - COLOR ";L3$(I); "
      - ";L(I)+2; " INCHES LONG."
2410 LPRINT"
2420 LPRINT TAB(20)"-----"
2430 LPRINT"
2440 IF K$(I)="T" THEN LPRINT"THIS WORK TICKET FOR TRAVERSE STYLE DRAPERIES"
2450 IF K$(I)="S" THEN LPRINT"THIS WORK TICKET FOR STRAIGHT HANGING STYLE
      DRAPERIES"
2460 IF K$(I)="V" THEN LPRINT"THIS WORK TICKET FOR VALANCE/S"
2470 LPRINT"
2480 IF S(I)=1 LPRINT TAB(10)"NUMBER PANELS THIS SIZE ";N(I)
2490 IF S(I)=2 LPRINT TAB(10)"NUMBER PAIR(S) THIS SIZE ";N(I)
2500 LPRINT"
2510 IF K$(I)="S" GOTO 2520 ELSE 2540
2520 LPRINT" FINISHED LENGTH PLEATED TO FULLNESS"
2530 GOTO 2550
2540 LPRINT" FINISHED LENGTH TO FIT ROD FULLNESS"
2550 B2$=" ###.##"
2560 LPRINT USING B2$;L(I),M1(I),D$
2570 LPRINT"
2580 LPRINT"YARDS FABRIC PRICE YD. COST OF FABRIC PATTERN REPEAT"
2590 GOSUB 3460
2600 IF (Y>.875) AND (Y<=1.0) THEN P=P+1
2610 B3$=" ###.## %"
2620 LPRINT USING B3$;P,PP$,M,KK(I)*M,P1
2630 LPRINT"
2640 LPRINT("< . . . YARDAGES ARE FOR THIS TICKET ONLY . . . >")
2650 LPRINT"
2660 LPRINT"YDS. LINING PRICE YD. COST OF LINING"
2670 IF L1$(I)="N" GOTO 2680 ELSE 2700
2680 LPRINT"UNLINED"
2690 GOTO 2730
2700 GOSUB 3490
2710 IF (Y>.875) AND (Y<=1.0) THEN PA=PA+1
2720 LPRINT USING B3$;PA,PP$,M,L,KL(I)*M1
2730 LPRINT"
2740 LPRINT"NUMBER OF RODS SIZE COST OF ROD/RODS"
2750 B4$=" ###.##"
2760 IF F7(I)>0 THEN 2810
2770 IF F7(I)=0 THEN 2800
2780 IF R2(I)>1 GOTO 2790 ELSE 2820
2790 LPRINT USING B4$;F7(I),R2(I)*.20;GOTO 2820
2800 MM=0:LPRINT USING B4$;0,0,0;GOTO 2820
2810 LPRINT USING B4$;F7(I),R2(I),R8(I)
2820 LPRINT"
2830 LPRINT" CUT AND SEW COST TO MAKE"
2840 B7$=" %"
2850 IF S7$="N" THEN UP$(I)="NO"
2860 IF S7$="V" THEN UP$(I)="YES"
2870 LPRINT USING B7$;UP$(I),M9(I)
2880 LPRINT"
2890 LPRINT"INSTALL/DELIVER COST TO INSTALL/DELIVER (MIN. $25 TOTAL)"
2900 IF I4=0 THEN K(I)=0
2910 B9$=" %"
2920 LPRINT USING B9$;I8(I),K(I)
2930 LPRINT"
2940 LPRINT"COST FOR THE "N(I); " ";K0$(I); " ON THIS WORK TICKET # ";I
2950 B8$=" $#####.## (LESS APPLICABLE TAX)"
2960 LPRINT USING B8$;KK(I)*M+KL(I)*M1+R8(I)+M9(I)+K(I)
2970 LPRINT"=====
2980 LPRINT"
2990 NEXT
3000 LPRINT"
3010 LPRINT" TOTAL ESTIMATE ( INCLUDING SALES TAX ) FOR THE ";R$
3020 B3$="TOTAL YARDS OF MATERIAL ###.## % @ $###.## PER YARD = ###.##"
3030 LPRINT"
3040 LPRINT"IN PREPARING THIS ESTIMATE THE COMPUTER RECOGNIZED"
3050 LPRINT"THAT WHEN COMBINING IDENTICAL YARDAGES FROM MULTIPLE TICKETS"
3060 LPRINT"SLIGHTLY LESS TOTAL YARDAGE MAY BE REQUIRED."
3070 LPRINT"THEFORE, THE FOLLOWING TOTAL YARDAGE FIGURE MAY"
3080 LPRINT"BE SLIGHTLY LESS THAN SHOWN IN THE ABOVE INDIVIDUAL"
3090 LPRINT"YARDAGE FIGURES."
3100 LPRINT"
3110 GOSUB 3520
3120 IF (Y>.875) AND (Y<=1.0) THEN 3130 ELSE 3140
3130 PT=PT+1:L=0
3140 LPRINT USING B3$;PT,PP$,M,(PT+L)*M1
3150 S0=(PT+L)*M1
3160 B4$="TOTAL YARDS OF LINING ###.## % @ $###.## PER YARD = ###.##"
3170 GOSUB 3550
3180 IF (Y>.875) AND (Y<=1.0) THEN 3190 ELSE 3200
3190 PH=PH+1:L=0
3200 LPRINT USING B4$;PH,PP$,M1,(PH+L)*M1
3210 SM=(PH+L)*M1
3220 B6$="DRAPERY RODS ###.##"
3230 LPRINT USING B6$;T5,T6
3240 LPRINT"
3250 B7$="SUB TOTAL ###.##"
3260 SU=S0+SM+T6
3270 LPRINT USING B7$;SU
3280 B8$="APPLICABLE SALES TAX .04625 ###.##"
3290 ST=SU*.04625
3300 LPRINT USING B8$;ST
3310 B9$="TOTAL OF MERCHANDISE + SALES TAX ###.##"
3320 TT=ST+SU
3330 LPRINT USING B9$;TT
3340 LPRINT"
3350 Z1$="LABOR TO MAKE ###.##"
3360 LPRINT USING Z1$;T7
3370 Z2$="LABOR TO DELIVER OR INSTALL (MINIMUM $25.00) ###.##"
3380 IF T8<25.00 THEN T8=25.00
3390 LPRINT USING Z2$;T8
3400 LPRINT"
3410 LPRINT"-----"
3420 Z3$="GRAND TOTAL $#####.##"
3430 LPRINT"
3440 LPRINT USING Z3$;TT+T7+T8
3450 GOTO 3810
3460 Y=ABS(L6(I)-FIX(L6(I)))
3470 GOSUB 3580
3480 GOTO 3680
3490 Y=ABS(R1(I)-FIX(R1(I)))
3500 GOSUB 3580
3510 GOTO 3710
3520 Y=ABS(T1(I)-FIX(T1(I)))
3530 GOSUB 3580
3540 GOTO 3740
3550 Y=ABS(T3(I)-FIX(T3(I)))
3560 GOSUB 3580
3570 GOTO 3770
3580 IF Y=0 THEN PP$="":L=0
3590 IF (Y>0) AND (Y<=.125) THEN PP$="1/8":L=.125
3600 IF (Y>.125) AND (Y<=.250) THEN PP$="1/4":L=.25
3610 IF (Y>.250) AND (Y<=.375) THEN PP$="3/8":L=.375
3620 IF (Y>.375) AND (Y<=.5) THEN PP$="1/2":L=.5
3630 IF (Y>.5) AND (Y<=.625) THEN PP$="5/8":L=.625
3640 IF (Y>.625) AND (Y<=.75) THEN PP$="3/4":L=.75
3650 IF (Y>.75) AND (Y<=.875) THEN PP$="7/8":L=.875
3660 IF (Y>.875) AND (Y<=1.0) THEN PP$="":L=1.0
3670 RETURN
3680 P=INT(L6(I))
3690 KK(I)=INT(L6(I))+L
3700 RETURN
3710 PA=INT(R1(I))
3720 KL(I)=INT(R1(I))+L
3730 RETURN
3740 PT=INT(T1(I))
3750 KK(I)=INT(T1(I))+L
3760 RETURN
3770 PH=INT(T3(I))
3780 KN(I)=INT(T3(I))+L
3790 RETURN
3800 REM THE FOLLOWING MUST REFLECT YOUR SPECIFICATIONS.
3810 LPRINT"
3820 LPRINT"THE ABOVE FIGURES WERE BASED ON:"
3830 LPRINT"MATCHING PATTERNS IF APPLICABLE."
3840 LPRINT"THE DRAPERIES OR VALANCES HAVING 5 INCH BOTTOM HEMS"
3850 LPRINT"WITH WEIGHTS AT SEAMS AND CORNERS."
3860 LPRINT"AND 5 INCHES BEING ALLOWED FOR HEADINGS."
3870 LPRINT"ALL ITEMS TO HAVE FRONT AND BACK SIDE HEMS SEWEN BY HAND."
3880 LPRINT"BOTTOM HEMS TO BE BLIND STITCHED BY MACHINE."
3890 LPRINT"JOINING SEAMS TO BE MACHINE OVERLOCKED."
3900 LPRINT"PINCH PLEATED ITEMS TO HAVE ROD HOOKS SEWEN ON BY MACHINE."

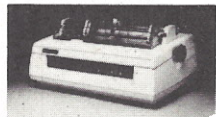
```


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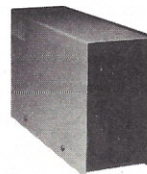
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CP/M BASED SOFTWARE for Zenith, Altos, Radio Shack, Apple

Software / Manual
w/Manual / Alone

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Z-80 SOFTCARD FOR APPLE: Your key to future software expansion. Get the best of both worlds. Apple's 6502 and CP/M Z-80. Plug in the card and get a Z80. Supports Apple language card and all Apple peripherals. Comes with set of three manuals. **\$339/\$75**

CCI-TELNET VERSION 5: A communication Package which enables microcomputer users to communicate both with Large Mainframes and other microcomputers. Extensive commands make it useful in many applications where communication between computers is necessary. Powerful terminal mode enabling

user to save all data from a session on disk. Completely CP/M compatible. Multiple communication protocols supported. Able to transfer files in both directions without protocol where the other machine does not support any protocol. Extensive ON-SCREEN help. Source code provided. **\$149/\$15**

MICROPRO-WORD-STAR: Menu driven visual word processing system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning. **\$399/\$40**

BDS 'C' COMPILER: Supports most features of language, including structures, arrays, pointers, recursive function evaluation, and overlays. Package contains: compiler, linker, library manager; sample source files include games, a terminal emulator with disk I/O plus the source for many standard library functions; BDS C User's Guide; Book - The C Programming Language by Dennis Ritchie and Brian Kernighan. Requires at least 24K of RAM. **\$125/\$20**

CONFIGURABLE BUSINESS SYSTEM BY DMA: CBS is a data management system that allows true transaction processing. The system features a screen menu generator and a comprehensive report generator which can be used to produce invoices, purchase orders, re-order reports, mailing labels or other special reports specific to the application. Good documentation and a demonstration inventory system supplied. Requires at least 48K memory. Does not require any support language. **\$295**

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Estimating Program Size

Will It Fit?

—BY DAVID LUBAR—

Does the following scene sound familiar? You've got a listing for a great program, but you don't know if it will fit in your computer. In this article I'll discuss ways to determine memory requirements for a program and ways to shorten those programs which don't quite fit.

First, some background. Memory space is required for two distinct purposes: storing the program and storing the variables. As a program is entered, it fills space moving downward from the top of available memory (HIMEM). Until you RUN the program, no additional space is required. During a RUN, each defined variable or DIM statement requires space. In some systems, these are stored starting at the lowest available location (LOMEM). In other systems, some variables are stored above the program. Either way, the total used for program storage and variable tables must be less than the total available memory.

It's possible to determine exactly how much room a program will require by counting every command and character in the listing, but this process is tedious. The best approach is to make a rough estimate.

Again, some background is helpful. Each line number requires five bytes. So if you have 4K and the program has 820 lines, you're in trouble. In most systems, a command requires only one byte since it is tokenized (represented in memory by a number). The length of the command doesn't matter; RETURN and LET each take only one byte. The biggest space users in listings are characters in PRINT statements. Every letter, number or space that isn't part of a command word will use one byte.

If the program contains arrays, a lot of space might be used. A very short program can, by using large

arrays, eat up memory. For example:

```
10 DIM A(100,100)
20 PRINT "IT FITS"
```

These two lines will fit in an 8K machine. But, as soon as the program is RUN, the space taken by the array will fill available memory.

To estimate the space required, first count the number of lines in the listing, or count the lines in one column of the listing and multiply by the number of columns. Next, determine the average length of a line. In some programs, all the lines are short. In other cases, there are many multiple statements. Taking this into account, find a line that seems average. To the five bytes for the line number, add one byte for each command and one byte for each non-command character. Multiply this figure by the number of lines in the program. If this total is close to the amount of available memory, there might be a problem. If not, the next step is to check the number of variables used. Your system documentation should contain information concerning the space used by variables and arrays. This space, added to the space used by the program listing, will be the amount of memory needed to enter and RUN the program.

If it won't fit, there are a number of solutions. First, go over any sections using PRINT statements. Some game programs contain fairly detailed instructions which can be shortened or, in extreme cases, removed. The instructions can be written on a file card. Just remember to change any lines which refer to PRINT statements that have been deleted.

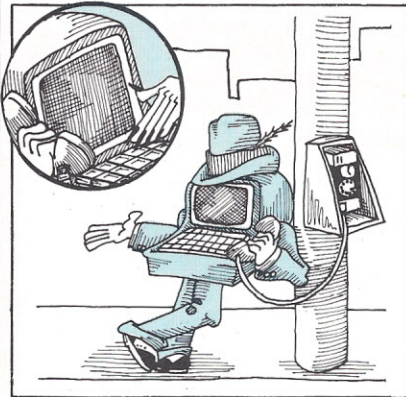
After shortening all printed portions and removing REMS, the next step would be to turn as many lines as possible into multiple statements. Before doing this, go through the listing and put a checkmark next to any line which is referenced with a GOSUB or GOTO. The lines which are checked should be left alone.

Mr. Lubar is a freelance writer who concentrates on science fiction and dabbles in humor (see his "Software Update" in July 1980 PC).

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Personal Computing
Special Features

October



Modems

Following up on last month's look at the growing phenomenon of computer networks, this month the editors examine an essential component of network systems: modems. These devices let your computer "talk" over the telephone with other computers, and hence let you access commercial network systems. A feature article will explain principles of operation, describe characteristics of various modems, and provide a list of vendors.

Also This Month:

Income Statements — Regular Profit and Loss statements are boring to prepare, but essential for controlling costs in your business. This program reduces the drudgery and produces professional P&Ls quickly and easily.

Computer-Assisted Grading — while it doesn't replace a teacher's judgment, this program helps teachers assign grades fairly by eliminating the tedious calculations needed to balance both performance against an absolute standard and relative performance within a group.

Personal Computing
Special Features

November



Holiday Buyer's Guide

This round-up will cover all types of microcomputer products — complete systems, peripherals, software and accessories. The editors suggest how readers can select appropriate products as holiday gifts for family, friends or themselves, based on the person's interests, needs and background. This special feature also includes a list of hardware and software vendors.

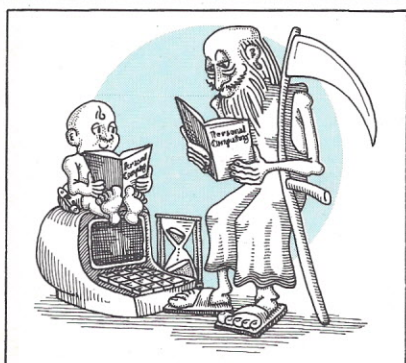
Also This Month:

Tracking Add-On Sales — In many small businesses, you need to know how effective your sales staff is in selling particular "add-ons" or accessory items. This program prints concise productivity reports for each salesperson and store.

Free-Form Storage and Retrieval — A general-purpose data base manager, this program lets you define and name categories to organize and retrieve various types of information — record collections, computer programs, mailing lists, etc.

Personal Computing
Special Features

December



The Year in Review

1980 has been the most exciting year ever in the personal computing field — and future years look even brighter. The editors will review the past year's trends and significant developments in microcomputer systems, peripherals, software and applications, and will examine their impact on the future.

Also This Month:

Depreciation Schedules — This program calculates depreciation based on one of the three basic methods (Straight Line, Declining Balance, and Sum of the Years Digits), and prints the results in standard IRS format.

PC Index — An annual feature, this index serves as a handy reference and a reader's guide to PC's programs and articles for 1980.

Return on Investment Made Simple

BY WILLIAM A. CARR

In the business world, one of the most useful and frequently performed calculations is the discounted return on investment (ROI) or internal rate of return. The ROI method is used in a wide variety of professions to rank capital projects, discriminate among various investment opportunities, study cash flow problems, and investigate any momentarily quantifiable situations involving an initial outlay and a return over time on that outlay.

The discounting concept is based on the time value of money; a dollar received today (present value = \$1) is worth more than a dollar received a year from now (present value = \$.943 @ 6% interest). The difference in the value of the two dollars is determined by the discount value rate applied, the discount rate being the inverse of the familiar compound interest formula.

The procedure for finding the ROI on a problem of the type mentioned above is to find the unique discount rate which will make the present, discounted value of the returns or income equal to the cost or outlay associated with the project or investment. Mathematically, we solve the following equation for r:

$$\sum_{i=1}^n (1/(1+r)^i)(X_i) = C$$

where r = the discount rate applied (annual basis); X_i = the i'th period's net income; and C = the initial cost or outlay.

This Basic program uses a converging iteration routine to solve the discount formula. The iteration loop limits and step size (line 280) are set according to the degree of accuracy required and the probable range of discount rates expected. In the example program, the

William Carr holds an undergraduate degree in economics from the University of Delaware and is currently enrolled in the MBA program at Widener College. He is a member of the American Society of Certified Engineering Technicians and the National Association of Business Economists.

Project A with sum-of-years-digits depreciation

WHAT IS NUMBER OF PERIODS (YEARS)?

?3

WHAT IS TAX RATE (50%=.5)?

? .5

WHAT IS PORTION OF TOTAL COST THAT IS DEPRECIABLE?

?1291000

WHAT IS BALANCE OF TOTAL COST?

?249000

INITIAL DEPRECIABLE INVESTMENT IS 1291000 DOLLARS

PERIOD	INCOME	EXPENSE	CAPITAL INVEST.	DEPREC. EXPENSE	UNDISC. CASH FLO
-----	-----	-----	-----	-----	-----
0	0	0	1291000	0	-1291000
0	0	249000	0	0	-124500
1	1135000	2000	0	645500	889250
2	760000	2000	0	430330	594165
3	635000	2000	0	215170	424085

ROI IS 19.14 PERCENT

PAYOUT IS 1.8857 YEARS

NONDISCOUNTED CASH FLOW (NET) IS 492000 DOLLARS

DISCOUNTED CASH FLOW FOR PERIOD 0 IS -1415500 DOLLARS

DISCOUNTED CASH FLOW FOR PERIOD 1 IS 746391. DOLLARS

DISCOUNTED CASH FLOW FOR PERIOD 2 IS 418593. DOLLARS

DISCOUNTED CASH FLOW FOR PERIOD 3 IS 250773. DOLLARS

..

Project A with straightline depreciation

WHAT IS NUMBER OF PERIODS (YEARS)?

?3

WHAT IS TAX RATE (50%=.5)?

? .5

WHAT IS PORTION OF TOTAL COST THAT IS DEPRECIABLE?

?1291000

WHAT IS BALANCE OF TOTAL COST?

?249000

INITIAL DEPRECIABLE INVESTMENT IS 1291000 DOLLARS

Continued

PERIOD	INCOME	EXPENSE	CAPITAL INVEST.	DEPREC. EXPENSE	UNDISC. CASH FLO
0	0	0	1291000	0	-1291000
0	0	249000	0	0	-124500
1	1135000	2000	0	430000	781500
2	760000	2000	0	430000	594000
3	635000	2000	0	431000	532000

ROI IS 17.855 PERCENT
 PAYOUT IS 2.07519 YEARS
 NONDISCOUNTED CASH FLOW (NET) IS 492000 DOLLARS

DISCOUNTED CASH FLOW FOR PERIOD 0 IS -1415500 DOLLARS
 DISCOUNTED CASH FLOW FOR PERIOD 1 IS 663103. DOLLARS
 DISCOUNTED CASH FLOW FOR PERIOD 2 IS 427652. DOLLARS
 DISCOUNTED CASH FLOW FOR PERIOD 3 IS 324988. DOLLARS
 ..

Project B with straightline depreciation

WHAT IS NUMBER OF PERIODS (YEARS)?
 74
 WHAT IS TAX RATE (50%=.5)?
 .5
 WHAT IS PORTION OF TOTAL COST THAT IS DEPRECIABLE?
 ?2000000
 WHAT IS BALANCE OF TOTAL COST?
 ?0
 INITIAL DEPRECIABLE INVESTMENT IS 2000000 DOLLARS

PERIOD	INCOME	EXPENSE	CAPITAL INVEST.	DEPREC. EXPENSE	UNDISC. CASH FLO
0	0	0	2000000	0	-2000000
0	0	0	0	0	0
1	750000	0	0	500000	625000
2	850000	50000	0	500000	650000
3	750000	10000	0	500000	620000
4	750000	10000	0	500000	620000

ROI IS 9.87 PERCENT
 PAYOUT IS 3.16935 YEARS
 NONDISCOUNTED CASH FLOW (NET) IS 515000 DOLLARS

DISCOUNTED CASH FLOW FOR PERIOD 0 IS -2000000 DOLLARS
 DISCOUNTED CASH FLOW FOR PERIOD 1 IS 568854. DOLLARS
 DISCOUNTED CASH FLOW FOR PERIOD 2 IS 538462. DOLLARS
 DISCOUNTED CASH FLOW FOR PERIOD 3 IS 467471. DOLLARS
 DISCOUNTED CASH FLOW FOR PERIOD 4 IS 425476. DOLLARS
 ..

discount rate is expected to be between 2 and 30%, while the 0.5 step size insures a fairly small incremental change each time through the loop, even on a million-dollar project. Line 430 must be changed to correspond to the initial limit set in line 280. Lines 520 and 530 then finish setting the accuracy of the calculation by stopping the iteration whenever the total net present value of the returns are within \$300 of the cost.

The program also calculates via an interpolation routine a payout figure, which indicates how long it will take to recover the initial investment in non-discounted dollars. Total cash flow is calculated by period, a net cash flow or total profit is derived and a separate schedule of the discounted cash flow is printed.

Input required in the internal data block (lines 850 to 980) is a period-by-period schedule of income, expense, depreciation and any further capital expense. Note that line 850 contains the data for period zero, the beginning of the project or investment. The initial capital cost should not be included in this line, however, as that is requested later under the input format. Any depreciation method may be used. The internal data block may have to be customized to handle other economic considerations — for example, an investment tax credit. This customization could be done by artificially increasing the first period's income datum, if the tax credit is taken on a flow-through basis.

Data requested in input format is the number of periods (months, years, etc.), tax rate, and how much of the initial cost is to be capitalized and how much of the initial cost is to be expensed. If any period division other than years is used, the discount factor formula (lines 400 and 690) will have to be adjusted to keep ROI on an annual basis. These lines can also easily be modified if continuous rather than discrete compounding is preferred.

For the sample runs, assume that the company's cost of capital or investment funds is 13% and the average total tax rate is 50%. Two projects, A and B, are considered, with project A being analyzed under two types of depreciation methods.

Project A is clearly profitable. ROI exceeds the cost of capital by a comfortable amount under both depreciation methods, with the straightline schedule reducing ROI by about 1.3%. Project B is clearly unprofitable. Its ROI is significantly less than the cost of capital and

its payout is longer. The correct decision, therefore, is to implement project A and eliminate project B.

The program will allow great flexibility in conducting economic sensitivity

analysis. The impact of different depreciation schedules, tax rates, project lengths and income flows can be rapidly examined by modifying input and the internal data block. In use a

little over a year, the program is run alternately on CDC Cyber 172 and Honeywell 440 equipment and has proven to be a valuable analysis and decision tool. □

Program Listing

```

00100 PRINT"WHAT IS NUMBER OF PERIODS (YEARS)?"
00110 INPUT X
00120 PRINT"WHAT IS TAX RATE (50%=.5)?"
00130 INPUT Z
00140 PRINT"WHAT IS PORTION OF TOTAL COST THAT IS DEPRECIABLE?"
00150 INPUT M
00160 PRINT"WHAT IS BALANCE OF TOTAL COST?"
00170 INPUT D
00180 PRINT
00190 PRINT"INITIAL DEPRECIABLE INVESTMENT IS";M;"DOLLARS"
00200 PRINT
00210 PRINT
00220 PRINT
230 PRINT"PERIOD      INCOME      EXPENSE      CAPITAL      DEPREC.      UNDISC."
240 PRINT"              INVEST.      EXPENSE      CASH FLO"
"
250 PRINT"-----"
"
00260 PRINT
270 PRINT USING 460;0,0,0,M,0,-M
280 FOR K=200 TO 3000 STEP .5
00290 LET R=0
00300 LET V=0
00310 LET Y4=0
00320 LET Y5=0
00330 FOR N= 1 TO (X+1)
00340 READ A,B,C,G
00350 Y1=A-B-C
00360 Y2 =Y1-(Z*Y1)
00370 Y3=Y2+C-G
00380 LET Y5=Y5+Y3
00390 IF Y3>0 THEN 00730
00400 Q=((Y3+G)*(1/((1+(K/10000))**(N-1))))-G
00410 REM
00420 LET R=R+Q
430 IF K>200 THEN 490
00440 REM
00450 PRINT USING 00460;(N-1);A;B;G;C;Y3
00460 :  **      *****      *****      *****      *****      *****
00470 PRINT
00480 PRINT
00490 NEXT N
00500 LET S=R-M
00510 REM
520 IF S>300 THEN 550
530 IF S<=(200-500) THEN 550
00540 GOTO 00570
00550 RESTORE
00560 NEXT K
00570 PRINT
00580 PRINT
00590 PRINT"ROI IS",K/100,"PERCENT"
00600 PRINT"PAIDOUT IS",E,"YEARS"
00610 PRINT"NONDISCOUNTED CASH FLOW (NET) IS",
      (Y5-M),"DOLLARS"
00620 REM
00630 PRINT
00640 PRINT
00650 RESTORE
00655 PRINT"DISCOUNTED CASH FLOW FOR PERIOD 0 IS";
      -(M*(1-Z)*D);"DOLLARS"
00660 FOR E=1 TO (X+1)
00670 LET F=E-1
00680 READ A,B,C,G
00685 IF F=0 THEN 710
00690 Q=((A-B-C)-(Z*(A-B-C))+C)*(1/((1+(K/10000))
      )**(F)))-G
00700 PRINT"DISCOUNTED CASH FLOW FOR PERIOD";F;
      "IS"; Q; "DOLLARS"
00710 NEXT E
00720 GOTO 00990

00730 LET Y4=Y4+Y3
00740 IF Y4>(M*(D*(1-Z))) THEN 00760
00750 GOTO 00400
00760 LET T=Y4-(Y4-Y3)
00770 LET W=(M*(D*(1-Z)))-(Y4-Y3)
00780 LET U=W/T
00790 LET V=V+1
00800 IF V=1 THEN 00820
00810 IF V>1 THEN 00840
00820 LET E=N-2+U
00830 REM
00840 GOTO 00400
850 DATA 0,0,0,0
860 DATA 750000,0,500000,0
870 DATA 750000,0,500000,0
880 DATA 750000,0,500000,0
890 DATA 750000,0,500000,0
900 DATA 50000,13500,2500,0
910 DATA 50000,13500,2500,0
920 DATA 50000,13500,2500,0
930 DATA 50000,13500,2500,0
940 DATA 50000,13500,2500,0
950 DATA 50000,13500,2500,0
00960 REM
00970 REM
00980 REM
00990 END
..

```


MEMORY EXPANSION FOR TRS-80*

All you have to remember is to plug it in

Memory expansion. It's a field packed with intriguing theories. For instance, it has been suggested that the memory areas of the human brain are transferable from one body to another, like transplanted kidneys. In man or machine, a larger memory is always a welcome acquisition.

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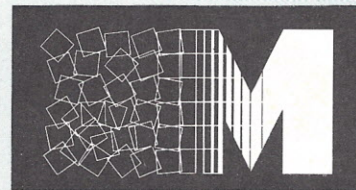
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With 32K RAM assembled and tested (MT-32C @ \$199.50)

Available from Microtek
or your nearest computer dealer.



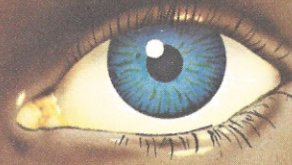
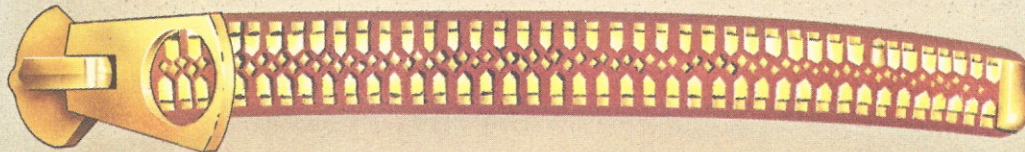
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CIRCLE 20

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MEMORY TRANSPLANT



The meteoric rise in gasoline prices is depressing enough without having a computer to remind you of just how much you're losing. However, for those of you with morbid curiosities, the following program will illustrate exactly how much of your mobility goes down the drain each time gas prices jump.

You simply enter old and new gas prices according to prompts from the computer. Prices under a dollar may be entered as decimal fractions of a dollar (e.g., 0.949) or as cents (e.g., 94.9). Any number entered in the latter way will be converted to a decimal in lines 215 and 225.

Next, input your car's average mileage and the amount of money you usually spend at the pump. From there the program uses the equations in lines 280 through 300 to provide

information such as the percentage of the price rise, the difference in the amount of gas received for your average expenditure, how many fewer miles that average purchase buys you, and so on.

I think the statistic showing how much you'd have to spend at the new price to travel as far as your average purchase would have taken you at the old price is particularly interesting. Here's inflation in action!

Line 90 contains a defined function which, as the remarks in the program explain, rounds the solution of the equations to two decimal places. Those of you not having a DEF function in your Basic can take the formula and substitute it for all of the FNA'd variables in lines 330 through 470. The characters before and after the variables in those lines are control characters used by the Commodore Pet to turn on and off the reverse field feature. □

Mr. Schnell is on the neurological nursing staff of the University of Wisconsin Clinical Science Center.

Gas Prices

BY PHIL SCHNELL

Sample Run

```
*****
*
* A PROGRAM THAT SHOWS YOU WHAT
* YOU LOSE EACH TIME THE PRICE
* OF GASOLINE GOES UP.
*
*****
```

OLD GAS PRICE? 94.9
NEW GAS PRICE? 101.9

YOUR AUTO'S AVERAGE MPG? 18
AVERAGE AMOUNT SPENT PER FILL? 10

OLD PRICE= \$.949 NEW PRICE= \$ 1.019
=====

NEW PRICE REPRESENTS A RISE OF 7.78% PERCENT.

CONGRATULATIONS! YOUR \$10.19, WHICH BOUGHT 10.19 GALLONS OF GAS AT THE OLD PRICE NOW BUYS 9.78 GALLONS AT THE NEW PRICE.

THIS MEANS THAT YOU ARE GETTING 7.78 FEWER GALLONS FOR YOUR MONEY, AND THAT YOU CAN DRIVE 7.78 FEWER MILES ON THE GAS THAT YOUR \$10.19 BUYS.

THUS, YOU WOULD HAVE TO SPEND \$10.72 TO TRAVEL AS FAR AT THE NEW PRICE AS \$10.19 WOULD HAVE CARRIED YOU AT THE OLD PRICE.

HAPPY MOTORING!!

Program Listing

```
30 REM DEFINED FUNCTION---
85 REM ROUNDS FIGURES TO 2
87 REM DECIMAL PLACES
90 DEF FNA(X)=(INT((X+.005)*100))/100
100 PRINT"Q";
110 PRINT"GASER!":PRINT
120 PRINT
123 PRINT"*****"
125 PRINT"*"
130 PRINT"* A PROGRAM THAT SHOWS YOU WHAT"
140 PRINT"* YOU LOSE EACH TIME THE PRICE"
150 PRINT"* OF GASOLINE GOES UP."
160 PRINT"*"
170 PRINT"*****"
200 PRINT:PRINT:PRINT
210 INPUT"OLD GAS PRICE ";G
215 IF G>2 THEN G=G/100
220 INPUT"NEW GAS PRICE ";G1
225 IF G1>2 THEN G1=G1/100
230 PRINT:PRINT
240 INPUT"YOUR AUTO'S AVERAGE MPG ";M
250 INPUT"AVERAGE AMOUNT SPENT PER FILL ";D
260 PRINT"Q";
265 PRINT"OLD PRICE= $";G;" NEW PRICE= $";G1
270 PRINT"=====
280 I=ABS(100-((1/(G/G1))*100))
290 A=D/G:A1=D/G1:L=A-A1
300 M1=(D/G)*M-(D/G1)*M:D1=((M1/M)*G1)+D
310 REM
320 REM
330 PRINT"NEW PRICE REPRESENTS A RISE OF";"FNA(I)"
340 PRINT"PERCENT."
350 PRINT
360 PRINT"CONGRATULATIONS! YOUR $";"D";", WHICH"
370 PRINT"BOUGHT";"FNA(A)"GALLONS OF GAS AT THE OLD"
380 PRINT"PRICE NOW BUYS";"FNA(A1)"GALLONS AT THE"
390 PRINT"NEW PRICE."
400 PRINT
410 PRINT"THIS MEANS THAT YOU ARE GETTING";"FNA(L)"
420 PRINT"FEWER GALLONS FOR YOUR MONEY, AND"
430 PRINT"THAT YOU CAN DRIVE";"FNA(M1)"FEWER MILES"
440 PRINT"ON THE GAS THAT YOUR $";"D";"BUYS."
450 PRINT
460 PRINT"THUS, YOU WOULD HAVE TO SPEND"
470 PRINT"$";"FNA(D1)"TO TRAVEL AS FAR AT THE NEW"
480 PRINT"PRICE AS $";"D";"WOULD HAVE CARRIED YOU"
485 PRINT"AT THE OLD PRICE."
490 PRINT
500 PRINT"HAPPY MOTORING!!"
```


You'll be a little richer after building one of these.

H-19 Professional Video Terminal



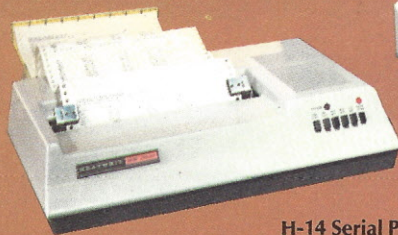
H-8 Personal Computer with Dual Floppy Disk Storage



H-11A 16-Bit Computer with Dual Floppy Disk Storage



H-89 All-In-One Computer with Floppy Disk Storage



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CIRCLE 21

CP-186



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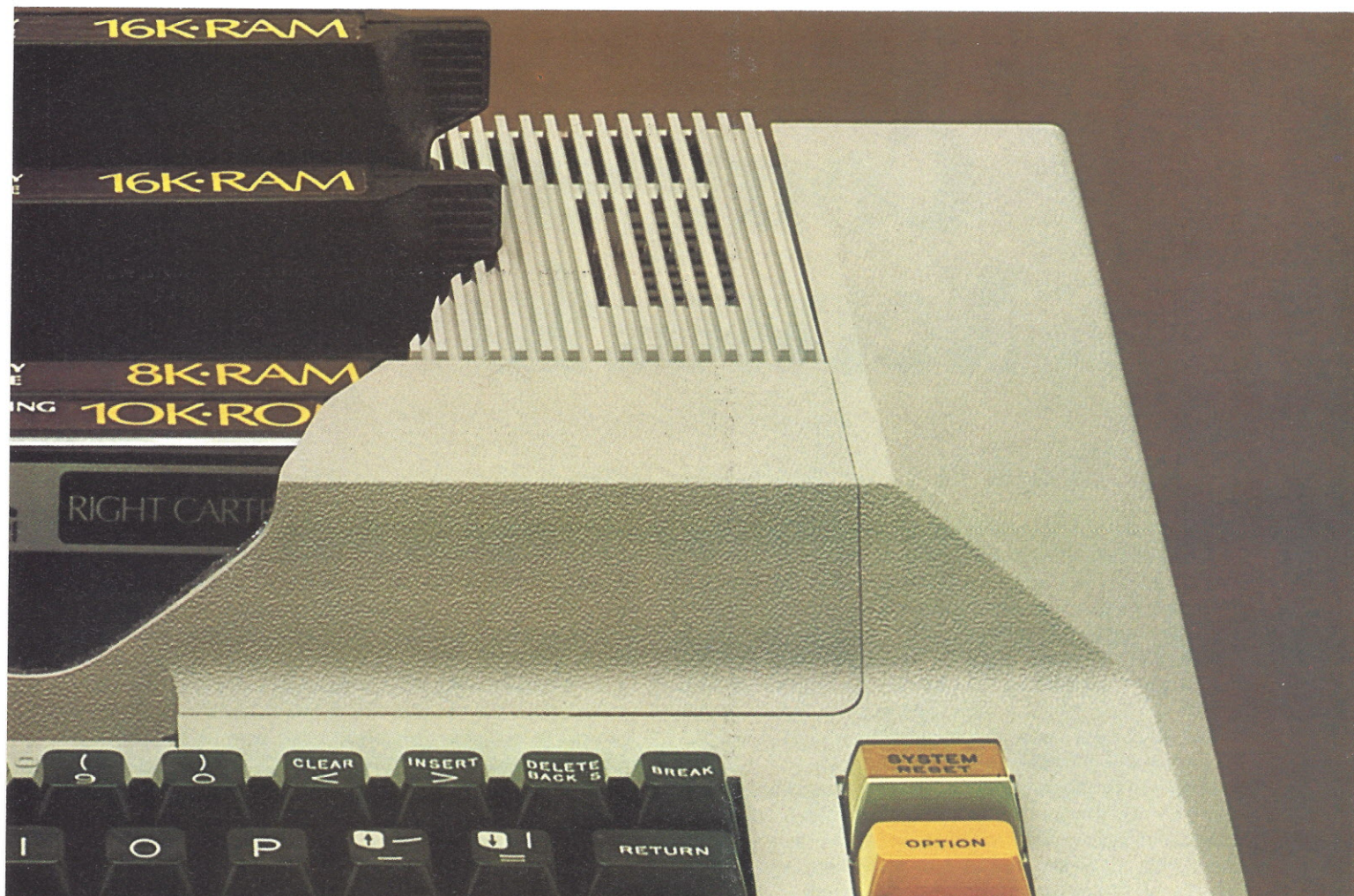
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CIRCLE 22

Computer Networking

—BY KEN MAZUR—

The Source and MicroNET dominate the field of personal computer communication networks. They are, however, just one portion of a larger phenomenon and to put them into proper perspective, let's consider the concept of networks in relation to personal computers.

One of the most active areas of interest in the microcomputer field, "networking," is the linking together of individuals and information. This concept (with ever-widening influence) has serious implications for the general public and the potential to substantially affect society.

Between the mental points of networks as concepts and networks as phenomena with wide-reaching influence, there's a lot of ground to cover; ground as firm as quicksand. Developments in the area of networking are occurring so rapidly that the ground doesn't have time to set.

Networks are fairly easy to understand. One way to envision a network is a bunch of points connected together by discrete lines (channels, tunnels, whatever). The pattern of lines connecting the points (or nodes) may vary and each network has a form. The form of a network can be used to serve different purposes: ditches connect to form irrigation systems; geographically separated radar stations connect electronically to monitor the skies; veins in leaves nourish cells.

Society has utilized networks for communication for some time: generals linked by messengers; the pony express; the telegraph; radios; television. As time progresses, science finds ways of connecting more and more individual points.

The technology that put a telephone and a television in every home is now making possible an evolutionary step in communications networks — personal computers or terminals tied together. The nature of the science and hardware used in a computer network to link individual points (you and me) give the network potential to expand faster and have more effect on all of us than any previous communication system. The ability to expand rapidly and the scope of activity available at each point of connection (intersection) become significant, as you'll see later.

At present, computer networking is going from a conceptual stage (in regard to putting personal computers/terminals in each home) to implementation. The idea isn't new. Businesses have used electronic networks for years. What is happening is the development of techniques that open participation in nodes of such networks to individuals. If you change the word "individuals" to "consumers," you see the economic possibilities. To that end, various companies, individuals and computer clubs are experimenting with options as to how to connect the points. Others experiment with what

to put at the nodes.

There are different "paths" for achieving the same end in linking a network. Railroads and highways are networks designed to facilitate movement from point A to point B. Though meeting the same objective, the systems use different technical means to accomplish the task: a railroad uses steel rails and lumber while a highway uses tar and soil. The selection of what to use to link points A and B brings with it the need to recognize parameters inherent in the nature of the technical means chosen. A locomotive is not designed to run on highways and a car would be less than effective on a rail system. There may be a number of "path" attributes (good and/or bad) to consider when linking points in a network.

Along with determining the best "path" to use, there are also several options as to what to put at the nodes of the network to use the paths most effectively. On a computer network, you can put either self-contained personal computers or terminals.

Three network node linking "paths" are receiving attention in the microcomputer field: two-way cable TV lines, radio transmission and telephone lines.

QUBE, a cable TV station in Columbus, OH, is tied to its subscribers through a two-way cable that allows viewers to respond to questions, surveys, tests and so forth. The system can also serve as a fire and burglar alarm for the subscriber's home. Hardware is elaborate at the central node of the network while the terminal nodes (the subscribers) have only a TV and small control box.

Though microcomputers aren't linked in the system, conceptual and technical similarities between a micro network and the two-way TV system have attracted interest. Some microcomputer users want channel space on cable systems set aside for computer-to-computer communications. At least two groups are pressing to establish such systems in areas that do not yet have cable TV. There's a lot of effort in making such a system operable but groundwork indicates response to the idea is positive on many fronts including the cities, the cable companies, and the persons interested in setting the system up with micros at network nodes.

Datacast of San Francisco, approaching from a different area of interest, proposes to transmit information (words and pictures) over FM frequencies not currently used by radio stations. A subscriber will need a radio receiver and a modified personal computer. For information contact Wireless Digital, 345 Swett Rd., Woodside, CA 94062.

Two-way cable and radio transmission are in experimental stages as is the next "path" linkage — phone lines. Connecting microcomputer systems or terminals via telephone lines

Promise and Peril

has progressed further than the other systems in terms of numbers of individuals who are already involved in functional networks.

Essentially, there are two major networks developing as consumer-oriented communications systems based on telephone lines: The Source, offered by Source Telecomputing Corp. of America, and MicroNET from CompuServe Corp. Although both systems have been evolving lately, certain basic characteristics remain even with some of the changes to be discussed later. (Comparison of The Source and MicroNET may be found in Figure 1.)

The Source, the older of the two national efforts, was instituted a little over a year ago with a home base in McLean, VA. The system (software, documentation, registration forms, etc.) is distributed in computer stores throughout the country or may be obtained directly from STC. According to a company spokesman, there were approximately 5000 subscribers as of late June. The company is expanding to be able to service thousands of additional subscribers by the end of the year.

Through services offered by The Source, users can tap into the UPI (United Press International) newswire that provides information broken into categories such as general, business, features and sports on national, regional and statewide levels. There is a 3-day backup of articles. The Source also offers extracts from The New York Times Consumer Data Base, which has a total of 4000 capsulized articles ranging from Abortion to White Collar Crime; over 120 research categories are available with an average of 30 to 40 stories per category.

Subscribers may run programs that deal with taxes or which analyze statistics from the Wall Street stock index. Users can "chat" to one another; send or receive point-to-point or multi-point messages (electronic mail); read business predictions; play games; and so forth. Programming languages available include Basic, Fortran IV, Pascal and Assembly.

The Source admits to experiencing growing pains the past year with problems arising in equipment breakdown, slow response time and sometimes lengthy waits for promoted services that were not yet on line. The company is correcting problems and plans expansion in services offered, according to Noel Jan Tyl, director of corporate communications.

Features added to the system lately include world air schedules providing direct flight information between major

cities and listings of connecting flights, and an "electronic catalogue" for shopping called Data Bucks. Subscribers join the Data Bucks service by paying a fee and can then order anything listed on the system at a discount. Data Bucks is offered by Compu-card of America, a large discount order house.

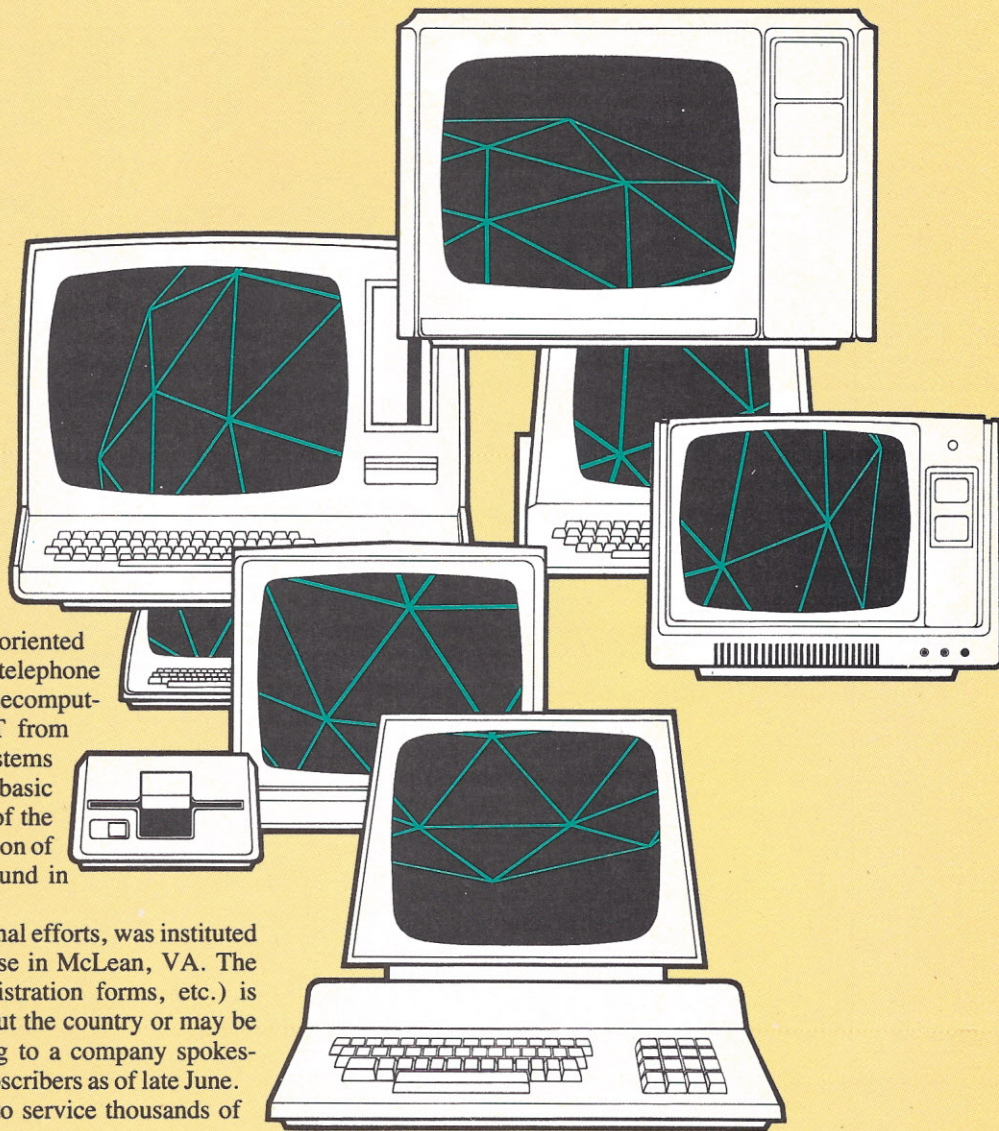
The *World Almanac and Book of Facts* has signed an agreement with The Source to make data services available. The network company also made arrangements with a national library network (OCLC, Inc.) to put Source terminals in public libraries around the country.

MicroNET is both "younger" and older than The Source. It is younger because as a consumer system, it began operating in the fall of 1979. The MicroNET package, however, is a night-time utilization of CompuServe's computer services which have been available to large businesses and government agencies for over 10 years. CompuServe is a subsidiary of H & R Block, Inc.

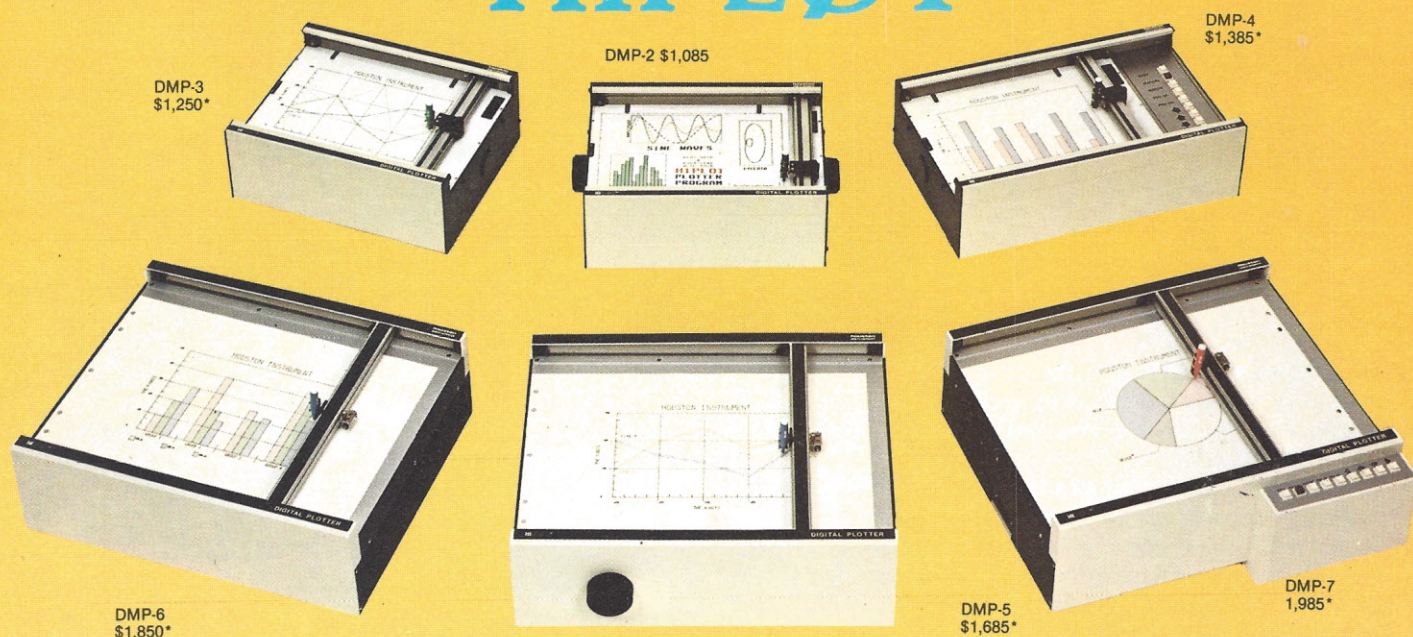
Like The Source, MicroNET aims its efforts toward a broadening base of individual users. Services offered include a national bulletin board, lists of users, program packages, special features, games, text editors, a software distribution exchange, utilities and a number of programming languages.

A feature that the MicroNET system offers which The Source does not is an automatic disconnect function which

Continued on p. 62



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*U.S. suggested retail prices only.

**DMP 2, 3 and 4 UL listed
DMP 5, 6 and 7 UL listing pending

Videotex: Low-Cost Networking

—BY KEN MAZUR—

Radio Shack and CompuServe Inc. (the MicroNET people) are working jointly to establish a consumer-oriented communication network available to individuals at a reasonable cost. Following an agreement between the firms, CompuServe will offer the CompuServe Information Service (the network links and central data bases) while Radio Shack markets hardware and software to access the network. Radio Shack calls its hardware/software packages Videotex.

For persons who do not have a microcomputer, Radio Shack is marketing a Videotex terminal for less than \$400. The unit, built into a molded 17 × 7-1/2 × 3" cabinet, lets you dial a predetermined telephone number to access the data base. You select data you want by pressing specified keyboard numbers and letters.

The Videotex terminal will let you communicate with a data base using an ordinary telephone line and see the results in color or black and white depending on your television set. Terminal installation consists of plugging one line into your telephone and attaching one video line to the antenna terminals of the TV. The terminal, similar to the TRS-80 Model I keyboard, has calculator-like keys. The unit is expected to be available in October.

Radio Shack, through its nationwide chain of stores and computer centers, will be the exclusive retailer of the software necessary to access the CompuServe Information Service through microcomputers. Users of the TRS-80 Videotex software package (slated to cost under \$30) will be able to access data provided by CompuServe through its national computer network. In addition to software for the TRS-80, Radio Shack will also be the sole distributor for the software necessary to link other brands of microcomputers into the network.

The TRS-80 software package comes on cassette media for about \$30; the retail price may vary at individual stores and dealers. TRS-80 owners planning to use the Videotex software must have an RS-232 serial board and a telephone interface.

More than 3000 personal computer users across the country utilize the

CompuServe personal computing service called MicroNET. The newer, broad-based CompuServe Information Service began July 1, with MicroNET remaining a component.

Initially, the network will offer a variety of services at hourly rates including major news wire services; electronic mail and bulletin board service; a variety of educational and financial programs; securities information; a computer software exchange; and various computer games.

Eleven of the nation's newspapers affiliated with The Associated Press (AP) will experiment with electronic delivery of news through CompuServe. The experiment, to continue for at least six months at each participating newspaper, will make available a daily "electronic edition." The newspapers were selected from more than 40 volunteer newspapers on the basis of marketing, communications and electronic factors. Other interested AP affiliates will participate in the experiment through an Overview Committee that will monitor the tests and provide advice.

The 11 newspapers to participate are: The Columbus (OH) Dispatch; The Washington Post; Los Angeles Times; The New York Times; Chicago Sun-Times; the St. Louis Post-Dispatch; The Minneapolis Star and Tribune; The Atlanta Journal and Constitution; The Norfolk (VA) Virginian-Pilot and Ledger-Star; San Francisco Chronicle; and The Middlesex News (Framingham, MA). The Columbus Dispatch is already available with other newspapers slated to link into the system at the rate of one additional newspaper per month.

Each newspaper will contribute news and computing expertise to produce an electronic edition delivering the data to the CompuServe computers. Programs at CompuServe format the editions for access by a home computer. Customers with a personal computer equipped to receive signals via telephone may read any newspaper's edition by placing a local telephone call in any of more than 260 cities nationwide. Outside those cities, toll charges would occur. The local phone call is answered by a local computer, part of CompuServe's nationwide packet-switching network. The local computer

will establish communication with the main Columbus, OH, computer system that contains the data base.

Bank One of North America, headquartered in Columbus, is slated to utilize CompuServe to provide on-line credit card verification and processing, according to officials. The network will interact directly with the bank's computer. The experimental program is designed to demonstrate the future capability of limited home banking services.

Services anticipated for the future include information on weather, transportation schedules, commodities, classified ads, inventories (unspecified), newsletters, library data, mail order service, medical and agricultural information.

Phil R. North, chairman of Tandy Corp. (parent company of Radio Shack), considers Videotex significant for two reasons. "First, our system is essentially ready for sale, unlike several which are in early planning or testing stages. Secondly, typical of Radio Shack's marketing techniques, Videotex is a very low cost way to go," he said.

"With under \$30 software and under \$400 hardware options, we think Radio Shack could well be the first in line in a technology that is certain to become a rather massive reality in the 1980s," North added.

Radio Shack describes the TRS-80 Videotex as the outgrowth of a device the company originally developed for a government experiment called Project Green Thumb. Radio Shack, because of its earlier help in developing the Weatheradio, was invited by the National Weather Service to participate in the project.

Project Green Thumb, an ongoing agricultural experiment, employs information retrieval to give farmers a choice of 22 categories of data, updated hourly by computer. Using terminals developed and built by Radio Shack in conjunction with Motorola, the network involves cooperation with the weather service, the University of Kentucky and the U.S. Department of Agriculture.

Green Thumb terminals are presently in use at 200 farms in Shelby and Todd counties in Kentucky. □

Figure 1

Company	Network	Costs			Storage		Access Interval
		Initial Hookup	Minimum Charges	Per Hour Charge	File Space	Additional Storage	
CompuServe, Inc. 5000 Arlington Centre Blvd. Columbus, OH 43220 (614) 457-8600	CompuServe Information Service (Formerly MicroNET) Distributed at Radio Shack stores and computer centers	\$30.00	Charges based on per minute usage	Prime time 6 am - 6 pm M-F Not available Non-prime \$5.00* per hr from 6 pm - 5:30 am Mon.-Fri. Also available all day Sat., Sun. & national holidays	128 K bytes	Possible to obtain on a case-by-case basis. Incremental amounts of on-line storage planned for future.	User must access files at least once every 30 days. After 30 days files are deleted.
Source Telecomputing Corp. 1616 Anderson Rd. McLean, VA 22102 (703) 821-6660	The Source Distributed directly through STC and computer stores nationwide	\$100.00	\$5.00 per month — \$3.00 minimum usage \$2.00 for storage block of 2K	Prime time 7 am - 6 pm M-F \$15.00 per hr Non-prime: 6 pm - 7 am M-F; weekends & national holidays \$2.75 per hr	Virtually unlimited	Available at 3.3 cents per day per 2K block of file space	No minimum access required

NOTE: *Additional \$2.00 per hr charge for users accessing facilities through Tymnet

occurs if you do not use your terminal within a 15-minute period. (Additional specifics may be seen in Figure 1.)

The two networking systems plan for rapid expansion and work daily to add services and streamline system use. For detailed information about services, write to the addresses provided in the chart.

In addition to these two national systems, there are many local bulletin board systems scattered throughout the country. One of these groups, PCNET (Personal Computer Network), is growing into a national electronic mail system for Pet computers. Unlike the major systems, PCNET does not use a central switching computer, which makes its network configuration different from The Source or MicroNET. For information on PCNET, contact People's Computer Co., Box E, Menlo Park, CA 94025.

To participate in one of the communication networks (The Source, MicroNET and PCNET), you need a terminal (a "dumb" video terminal or a microcomputer system), a telephone and a modem, a device to translate signals from the computer to a form acceptable for transmission over telephone lines. You also need an active credit card account. (See *Personal Computing's* special report on modems in the next issue.) You receive software, documentation and related materials when you subscribe.

Trying to list immediate, productive benefits a person could derive from linking into existing communication networks is difficult. It's like trying to describe the benefits people receive reading in libraries. Everyone is "reading," but the ultimate ends to which that transfer of information will be put would appear to be as varied as the number of individuals doing the reading. A data base is an electronic version of a library. The data base is information and the uses to which that information is put should be more extensive (because of the microcomputers at the nodes) than those coming from our libraries.

It is still cheaper to get your news by buying a newspaper and reading it than to get that news by computer network — but with the network, you can set up a selective news service

by culling from all articles only those subjects which interest you. That's today; tomorrow is very likely to be different.

On a practical level, for instance, a person who is not a specialist in tax law may call up a program from a data base to calculate personal income tax levels. All the user has to do it answer the program's questions and *voila* — instant tax expertise to the benefit of the citizen.

To look ahead even further, you may be able to tap into a data base which contains a digital version of your favorite piece of music. From another data base (or maybe the same one) you call up a hologram that you find "goes well" with the music. Or, instead of the music and hologram "playing," you may decide to call up the latest in computerized, participatory novels and "read/experience" the volume. A dream? There is already talk of the day when video disk, microcomputer and acoustic technologies merge.

The network experiments indicate the interest in network concepts but there is another indication as well — business agreements within the field.

In recent developments, Radio Shack became the exclusive distributor for the CompuServe Communication Service (see Videotex article on p. 61).

On another front, Source Telecomputing Corp. signed an agreement with Tymshare Inc. to broaden The Source's service capabilities. Tymshare operates more than 50 main-frame computers and had a 1979 sales volume of nearly \$200 million. Tymshare's subsidiary, Tymnet Inc., which operates the Tymnet public packet communication network serving 200 cities, will also be used in The Source expansion program.

It's easy to see many potential benefits of a personal communication net but the success of the network experiments will depend on many factors, with consideration of profitability sure to be among them. Technology spreads fastest when a profit's being made.

While corporations watch their cash flow during the next year, consumers are making economic decisions now on a more personal level.

Access		Printed Support			Services	Entry Package
"Local" Cities	Others	Name	Publication Period	Cost	**Sampling of Data Bases	
Twenty three metropolitan cities on-line as "local" telephone calls	230 cities available through Tymnet	Update (Newsletter format)	Intermittent at present time. Firm hopes to go bimonthly.	Free to MicroNET subscribers \$1.50 per issue charge for general public	Languages: AID, APL, Basic, BLISS 10, FOCAL, MACRO, Pascal, Snobol, Fortran. Other services: MicroQuote, Electronic Mail, Bulletin Board, CB Simulation, Personal Financial programs — FINTOL (several programs), Games, Newspaper.	Software, User manual, User ID number, Password, 1 hr free time
300+	Arrangements made to expand network in the future through agreement with Tymshare Inc.	Sourceworld (Magazine format)	Monthly	Inaugural issue free to Source subscribers. A subscription charge may be instituted in September.	Languages: Basic, Cobol, RPG II, PL 1, Fortran, Assembly. Other services: UPI, Finance section, Electronic Mail, Discount Shopping Service, Air Schedules, Games, Personal Finance.	Source's User Guide & Master Index, Account number, Password, Software

**These items are particularly subject to change. For a complete update as to services offered write to the companies.

As the country fights recession, consumers will be deciding whether a communications network is of any value to them as individuals. Those multiple decisions will be reflected in the sale charts.

While alluring visions of network potential help build anticipation of a world filled with new found capabilities, less pleasant alternatives are equally easy to conjure up.

Let's assume people derive enough benefit from communication networks that economic success is the order of the day and the links grow in number. We stride confidently into the future with electronic knowledge at our fingertips.

The future we step into could be different from the one we envision. A two-way fire and burglar alarm system is great. A little aberrant technological tinkering, however, and pretty soon the system can listen too. Enough interest, expertise and money could change that video in the living room into a two-way window. Maybe you would know; maybe you wouldn't.

Remember the illustrative individual who received help in preparing his taxes? Maybe he has the added benefit of an electronic checkbook and bank account. He's able to know everything he could ever want to know about his financial resources and their actual disposition. Now add this to the scene: There's a buffer in the system that the user doesn't know about and everything he runs through his terminal is shot off to the buffer and sent back through the network to a central node where lo and behold, there's someone peeking at what Mr. X is doing with his money. Just one of many possibilities.

Even intermediate transition stages of network growth might have unfortunate consequences. For instance, one of the more popular features of computer networking is "electronic mail," the sending of information from author to recipient via the computer network. An emerging number of prognosticators claim the U.S. Postal Service will eventually become obsolete. Consideration: With postal workers comprising one of the largest single work forces in the country, won't the obsolescence of their function in society have some

effect on both them and society? We will have to think out the consequences of change and plan for orderly transition.

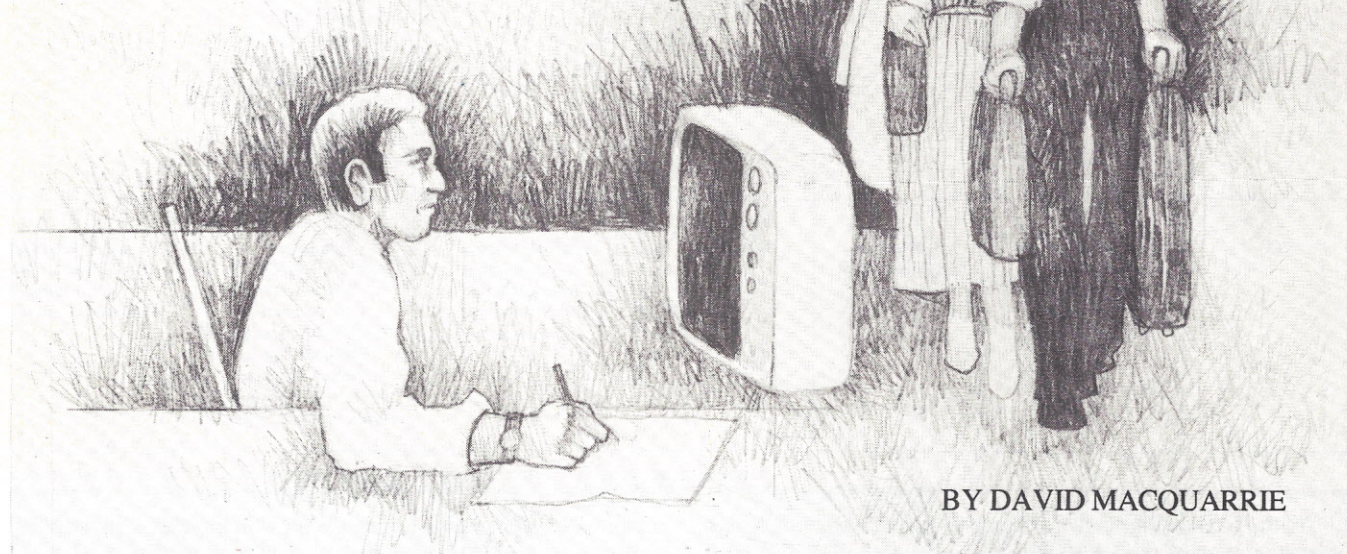
Farfetched, alarmist scenarios of the future perhaps, but possibilities nonetheless. One way to solve a problem is never to let a situation become a problem in the first place. Trite but true. Technology has a way of bending to need, however, and what we finally get in the way of personal communication networks may be nothing envisioned today. The inability to accurately forecast the final product must force us to consider the potential for rapid installation and growth of personal information networks.

Unlike the time consuming establishment of the telephone and television networks, a computer network could spread relatively instantaneously (assuming desire and hardware availability) through those already established networks. By linking television, telephone and terminal, a more powerful, flexible and influential network system is created than anything provided by each system alone. That next level of network efficiency can be obtained simply by using the massive systems of phones and TVs already in place.

With the potential for this kind of rapid expansion, change may occur quickly and decision times may be small. Start asking yourself questions now: What kind of communication system do we want? What should it be able to do? What do we want it not to do? How many should there be? Who's going to run the networks? How do we protect our privacy? How can everybody get involved in the decision making processes needed to make the service valuable to each individual? What are the benefits? What are the consequences? And on, and on.

As we've seen, networks offer great potential in making person-to-person communication more powerful and efficient. Developments are taking place rapidly with changes and expansion coming on almost a daily basis. The increased attention to personal computer communication networks must force us to think about the future to plan for what may lie ahead. The next six to twelve months should give some indication of how society reacts to the network concept. □

Canada's Experiment With Two-Way TV



BY DAVID MACQUARRIE

February 18th. Election night in Canada. Most political pundits agree the battle is being fought along the grounds of political leadership and the government's budget. But how did the average Canadian perceive the election, and on what issues would he vote?

Viewers of the Canadian Broadcasting Corporation's coverage that night saw a device that will soon change the way they think about television.

A reporter stares uncertainly at a small calculator-like device in his hand. He turns to the camera and explains that an instant viewer poll is about to take place. A number of randomly selected families across the country have been given these calculator devices, and in just a moment they'll be asked to participate in a nationwide survey.

The Question: What made you vote the way you did? A number of answers flash on the screen and the calculator users are asked to choose among them. Within seconds, it's obvious that the people polled considered leadership the most important issue. Pierre Trudeau's Liberal Party swept to power after an eight-month absence.

The small calculator is the interactive component of the Canadian government's experiment with two-way television. Called Telidon (from the Greek meaning "to see at a distance"), the system is also comprised of a brief-

case-sized 40K computer and an average color television set. At least that's all the user sees. A huge computer data bank in Ottawa is connected to the home sets by telephone lines, cable TV or optical fibers.

Uses of Telidon go far beyond the viewer poll of election night. Although the main computer is located in the nation's capital of Ottawa, there are plans to link up with university campus computers and, ultimately, connect with computer systems abroad. The system has already been tested via satellite in Australia. It's now possible to take courses at Oxford while studying in Montreal; or read of riots in Iran as they happen, and not wait for the newspaper or the evening television news. And yes, Star Trek is available as well.

Besides being time-sharers, users of Telidon will gain other benefits as well. With the addition of an optional alphanumeric keyboard, a fisherman in Joe Batts Arm, Newfoundland, can talk shop with a fisherman in Vancouver, British Columbia. And, if the system is linked together by cable TV, he can avoid Ma Bell and the Canada Post. A lumberjack in Northern Ontario can play chess with a housewife in Toronto. And you can make reservations for a trip abroad while sitting in front of your TV — months before leaving. These applications are possible because the computer cannot only access the data

banks in Ottawa, but can talk to one another as well.

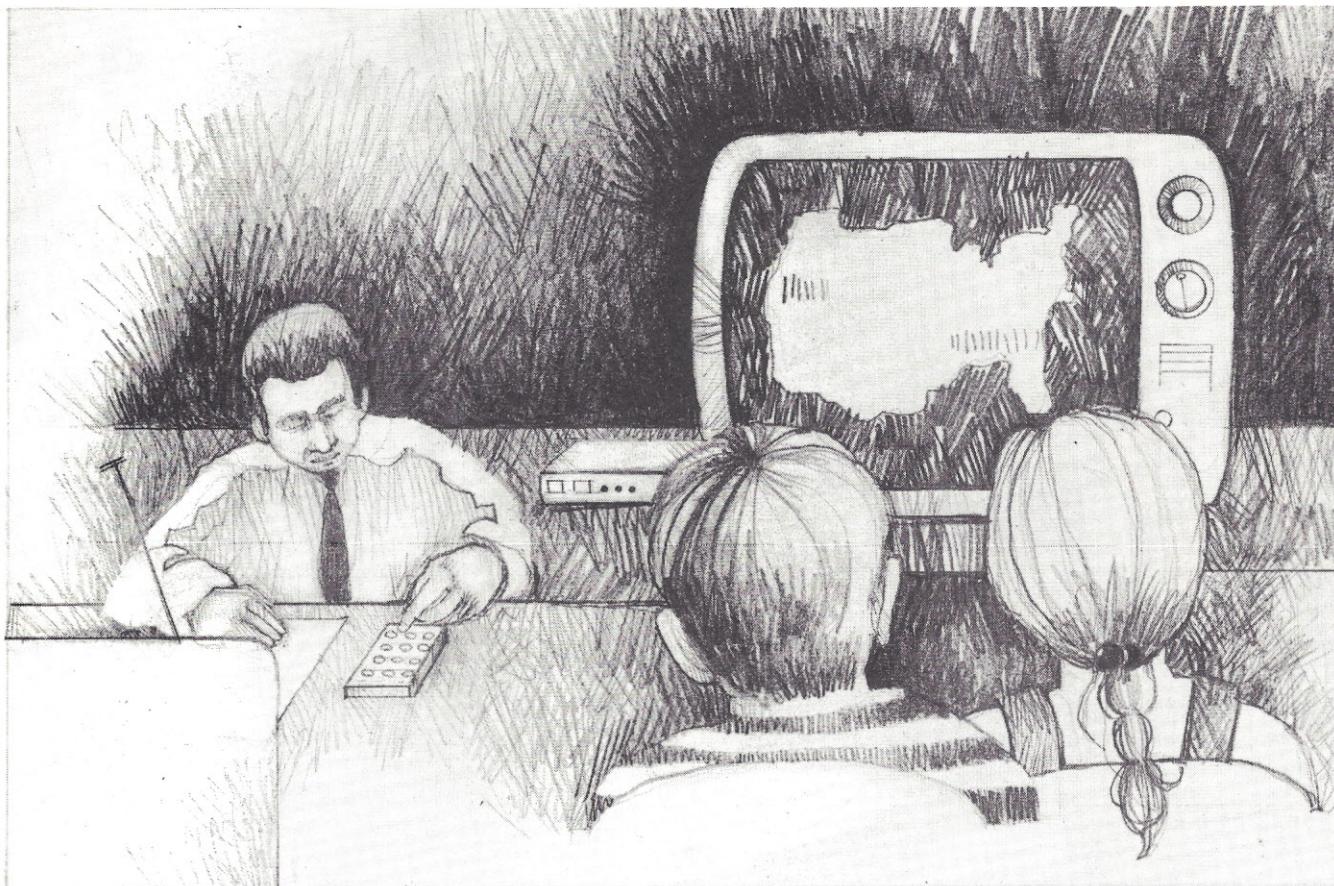
How exactly does it work? Information appears on the screen in the form of "pages." One page fills a screen, and each page is given a number. You consult a catalog to discover what pages are available and summon them by pressing the number on the calculator.

You can also discover information branch by branch like you would climb a tree. For example, if you're interested in traveling in Canada, press the appropriate number for tourism. A page showing the Canadian provinces will appear on the screen. Press Ontario, and another page will pop up. It will also show a list of subcategories — say, history, travel, economy and so forth. Press travel and you'll be asked what kind of transportation you're interested in, where you would like to stay and what you would like to do. Keep accessing pages and you can find all the tourist spots in Ontario, see maps of the bicycle trails in Ottawa and make reservations at a trailer park.

Why is the government and not private enterprise developing Telidon? By accident, really.

"We were looking for a communication system that would help the deaf communicate," said Angela Bourgeois, Information Officer for the Department of Communications in Moncton, New Brunswick. "As we

Illustrated by Jacky Brill



were searching, we came upon these types of systems in Europe. Knowing where we were at technologically in Canada, we knew we could do better. We're now about a year ahead of everyone else in this area. The Europeans can't touch us in graphics alone."

The graphics are spectacular. The system is capable of reproducing half-tone photos, the kind newspapers print, and with the same resolution. Canada is trying to make Telidon the standard of the industry so all nations will have compatible hardware. The eventual hope is a global computer network.

"We as a government are not going to market it," Bourgeois said. "We're talking to industry, provincial governments and the cable companies to let them know Telidon is ready to be mass-produced."

Bell Telephone is putting the system to test in Ontario and Quebec. One thousand homes in Toronto and Montreal are now being tested to check consumer reaction. Across the country, other businesses are also experimenting with the Telidon system. Government is lending expertise and equipment because the cost is so high, but the hope is that by the late 1980s the units will be mass-produced at a surprisingly low estimated cost of \$250.

There will be a mix of free information and information you'll have to pay for once Telidon makes it to your liv-

ing room.

"If you're calling for consumer information, like grocery price lists, the store you're calling will provide the information for free," Bourgeois said. "But if you're calling, say, somebody's book on Telidon, the subscriber will pay."

The news services will also want subscribers to pay for the information they'll provide, but it will likely cost less than the daily newspaper. All government-placed information will be free, such as the weather forecast or tourism information. And if you're a cook, you can expect a few cents in royalties every time someone bakes your soufflé. That's right, subscribers will be able to place information into the main computers as well as receive it.

With all this information on the loose, and with much of it personal (like banking), there have been fears that Telidon is the harbinger of the Big Brother society of George Orwell's *1984*.

"Privacy of information is something that must be studied," said Bourgeois. "I don't want people to know what's in my bank account and neither do you. The Royal Canadian Mounted Police may want to share some information with us, but some will have to remain theirs. The other thing is who is going to legislate this? There is nothing written in the lawbooks now. What will it do to the family?

These are all questions that need to be answered. We have named a consultative committee who will look at the various aspects of Telidon — the psychological, sociological, economical aspects and so on. As we carry out the field trials, hopefully the problems and some of the solutions will be relayed to us."

Privately, the Department of Communications is very worried about the question of privacy of information. Business and corporation use of social insurance numbers (the numbers government assigns to Canadians for census and tax purposes only,) has sparked such controversy that a Commissioner of Privacy was appointed to look into the problem. Telidon's potential to build personal files on individuals far outweighs the threat social insurance numbers pose. What will instant access to unlimited information do to Canadians? The studies will have to be completed fast. The telephone companies in particular are interested in making Telidon economically feasible by 1987. Three years after 1984.

The potential for convenience and learning make Telidon look very attractive. Perhaps by 1987 Canadians won't have to leave the comfort of their homes and brave the winter weather to register their votes at the polls. They may sit back in their easy chairs, call up some personal data on the candidates, push a button and cast a vote via Telidon. □

Music : to Soothe the Savage TRS 80

BY HUGO T. JACKSON

Has debugging your current program got you tearing out your hair in desperation and reduced you to a hopeless bundle of nerves? Relax. You and your TRS-80 can now make beautiful music together. Soothe your tender nerves as you listen to your computer play Beethoven, the Beatles or even a composition of your own creation.

If you can't wait to start humming along then just type in the program from the listing, hook up your TRS-80 as described below, read the instructions for running the program and enter the sample tune provided. If you're interested in how the TRS-80 becomes a musical virtuoso, you need to understand some basic fundamentals of sound and music.

The Nature of Sound

For something to be heard, it must cause the surrounding air to vibrate back and forth, sending out waves of varying air pressure which make your eardrums vibrate in the same manner. For instance, if you stretch and pluck a rubber band you will hear a tone. In physical terms it is the actual piece of elastic that is pushing the surrounding air back and forth and every time this piece of elastic reaches its most inward position it has completed one cycle. The number of cycles it completes in one second determines its frequency or pitch.

If it took one tenth of a second to complete a single cycle then its frequency is ten cycles per second. Similarly, if we know something has a frequency of thirty cycles per second we know that it has a cycle time of one thirtieth of a second. The average per-

son can detect or hear frequencies from roughly 24 to 24,000 cycles per second.

In the world of electronics we use a speaker to push the air back and forth much in the same manner as a rubber band does, using electricity as the motive force instead of the pluck of our finger.

Applying a positive voltage to a speaker causes the speaker cone to push out; conversely negative voltage pulls it in. By alternating the voltage delivered to a speaker we make the speaker cone vibrate and produce an audible tone.

How does this relate to the TRS-80? Believe it or not, every time you save a program on cassette your computer is demonstrating its potential for making music. For a demonstration of this, remove the earphone plug from the cassette recorder while you play a program you previously recorded. Admittedly what you hear is not very pleasing; but you are listening to tones that are of a precise pitch and frequency. When you CSAVE a program the computer is supplying the microphone plug with a stream of positive and negative voltages which when hooked up to a tape recorder serves as an ideal method for storing digital information.

The trick in getting the TRS-80 to behave in a more pleasing musical fashion lies in taking control of the computer's circuitry that supplies the different voltages to the microphone plug and manipulating it in a manner that will allow you to produce musical notes.

Here is the good news: You don't need any integrated circuits, soldering iron or screwdriver to effect this con-

trol. To accomplish the task requires only two instructions: OUT 255,5 and OUT 255,6. Outputting a 5 to port 255 instructs the computer to deliver a negative voltage to the microphone plug. OUT 255,6 results in a positive voltage appearing at the microphone plug.

After hooking up your computer as described later in the article, try the simple three line program in Figure 1.

The low note you hear is the result of the computer acting upon your instructions and rapidly changing the voltage at the microphone plug from positive to negative in a continual loop. This in turn causes the speaker to push the air

```
100 REM** PROGRAM A **  
110 OUT 255,5  
120 OUT 255,6  
130 GOTO 110
```

Figure 1

back and forth at an extremely fast rate.

In this short program, cycle time is defined as the period between the time the computer initially executes line 110 until it begins execution of this same statement line again. Even though the GOTO statement line is not delivering a voltage to the microphone plug, the time taken to execute this instruction must be included in calculating the cycle time and frequency.

The pitch of a note is directly proportional to its frequency. The higher the frequency (and as a result the shorter the cycle time), the higher the note will sound. If we increase the cycle time, thereby reducing the frequency, the note will sound lower.

Try the program in Figure 2. When

you run this program, observe that the second note was lower in pitch as well as longer in duration. The reason for this is that the rate or frequency at which we encountered any same instruction again was lower. We achieved this by increasing the cycle time of the second note. Whereas the

```
100 REM** PROGRAM B **
110 FOR A=1 TO 100
120 OUT 255,5
130 OUT 255,6
140 NEXT A
150 FOR B=1 TO 100
160 OUT 255,5
170 OUT 255,6
180 OUT 255,6
190 NEXT B
```

Figure 2

cycle time of the first note was achieved through the execution of four commands, the second was comprised of five and resulted in a tone of lower pitch.

This longer cycle time also explains why the second note was longer. Both tone and generating For-Next loops stipulated one hundred repetitions, so it naturally took longer to complete the second tone as it involved the execution of an extra instruction in each loop. If you substitute line 110 with FOR A = 1 TO 1000 and change line 150 to read FOR A = 1 TO 800, you will discover that although both notes are of a different pitch, they are now of equal length (roughly ten and one half seconds).

```
100 REM** PROGRAM C **
110 INPUT A
120 INPUT B
130 FOR C=0 TO A
140 FOR D=0 TO B
150 OUT 255,5
160 NEXT D
170 OUT 255,6
180 NEXT C
190 GOTO 110
```

Figure 3

Since we will have constant need for tones of different pitch and length we have to design a subroutine that will serve as a multipurpose tone generator. An example of one you may experiment with is shown in Figure 3.

With this program you will discover that when you increase the value of B the pitch of the note will drop, while decreasing the value shortens the cycle time and results in a note of higher frequency and pitch. Different substitu-

tions for the value of A will affect the length of the note. The smaller the value, the shorter the duration; the greater the number, the longer the note will sound.

At this point we run into a problem. When using Basic the highest note we can create is the one we produced using the program in Figure 1. Not very encouraging if we want our computer to at least rival the note range of a piano. The solution is to use a short machine language program that is capable of executing our OUT commands at a much faster rate.

If you are unfamiliar with machine language you needn't worry. The routine used in this program is almost identical in structure and purpose to the Basic program in Figure 3. You needn't run out and buy a program that allows you to enter machine language either, since the main program pokes this machine program into high memory during the initialization process.

A Little Music Theory

The fundamental basis of a music system is the scale. A scale merely stipulates the different frequencies of the notes used in a composition. For the last two hundred years popular western music has been based on the Tempered Scale. While anyone could rightfully argue that top forty radio material is a world removed from the compositions of the classical composers, they still share the same musical scale.

The Tempered Scale is composed of

octaves, and in each octave there are twelve notes or semitones. To determine the frequency of any note we merely have to multiply the frequency of the note directly below it by 1.0595. This "magic" number is referred to as the pitch ratio.

All that remains is to determine the frequency of any one note and it will be possible to determine the frequency of any other note. Our standard frequency is 440 cycles per second and this is the generally agreed upon pitch for A below middle C (or the A of octave number four). Therefore, to determine the pitch of A#, which is a semitone above our base frequency, we multiply 440 by the pitch ratio. To calculate the frequency of B, which is a semitone above A#, once again we multiply the pitch ratio times the frequency of A#.

Figure 4 shows the names of all the notes in an octave. All notes have more than one name even though they share the same frequency. The important thing to realize is that a scale has no theoretical end. Travelling in a clockwise fashion you will be increasing the pitch of the note with every semitone you encounter. When you reach A again, you have entered a new octave. While the frequency of A in the new octave may be determined by multiplying the frequency of G# by the pitch ratio, it is much easier and just as accurate to simply double the frequency of A in the lower octave. This holds true for any note; its frequency may be determined by multiplying the frequen-

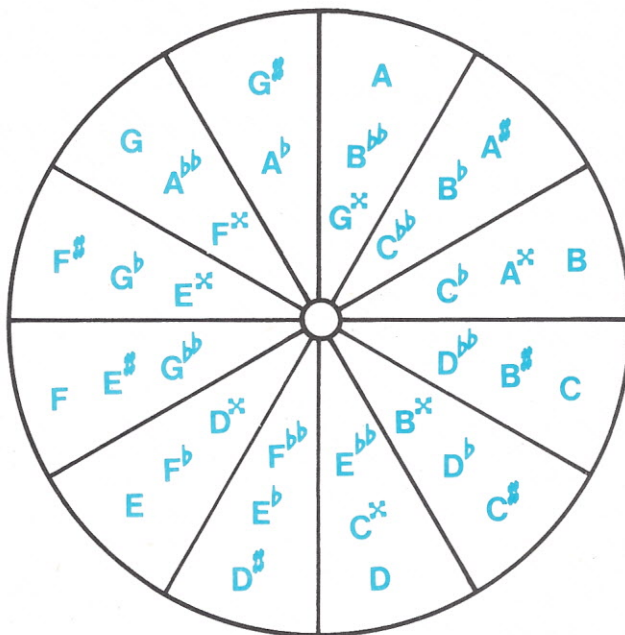


Figure 4 Notes of the tempered scale

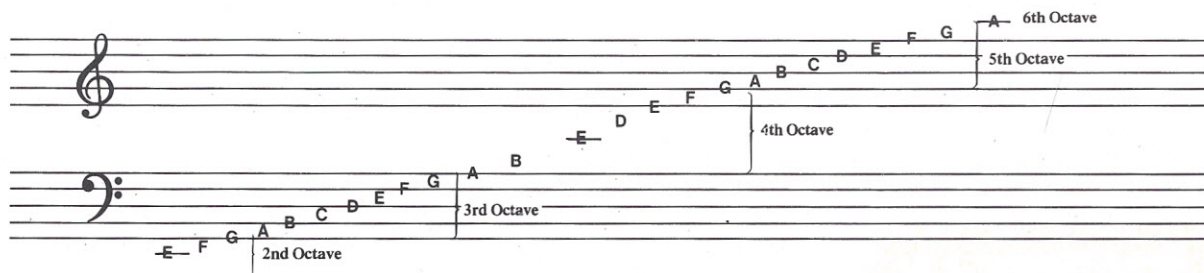


Figure A

cy of the same note in the octave lower by two.

Now that we are able to determine the frequency of any note, it is a simple matter to regulate its length. If the frequency of a note is 440 cycles per second we know that it has a cycle time of $1/440$ of a second. Assuming we have set up a tone generator having a cycle time of $1/440$ of a second we would have to repeat this loop 440 times for the tone to last one second. If we only wanted it to last for half a second we would only allow the tone generating loop to cycle 220 times.

Basically, that's all this program does. After you have decided what note you want by its letter name, octave and beat value, the program calculates its exact frequency and converts this value to a number that when substituted in a For-Next loop will cause the computer to output a tone of the correct pitch. According to the beat value of the note you specified, the program calculates how long the tone-generating loop should run. The program then stores the results of its computations in high memory for the machine language program to use when it actually outputs the note.

When it comes right down to it, the rest of the program is just window dressing that provides a number of other helpful features that allow you to manipulate the tune already stored in memory.

How To Read Sheet Music

(If you already know how to read sheet music, you can skip this section.)

There are two things we need to know about a musical note. First its pitch and second, its beat value. Both these factors are defined precisely and efficiently through musical notation.

Music is written on a staff. These five lines and four spaces indicate the pitch of the note according to where it is placed. Most of the music you will encounter will be in the treble and bass clefs and the names of the notes in these two clefs as well as their octave place-

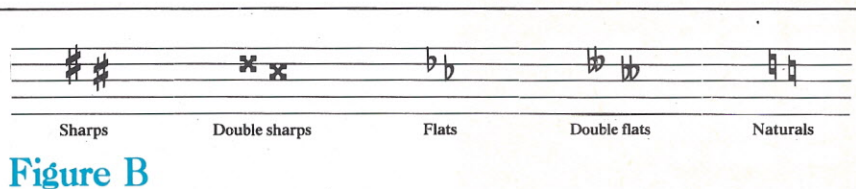


Figure B

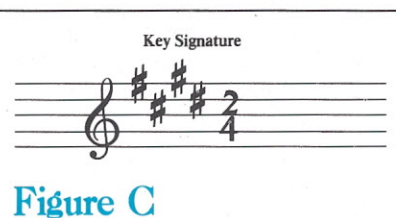


Figure C

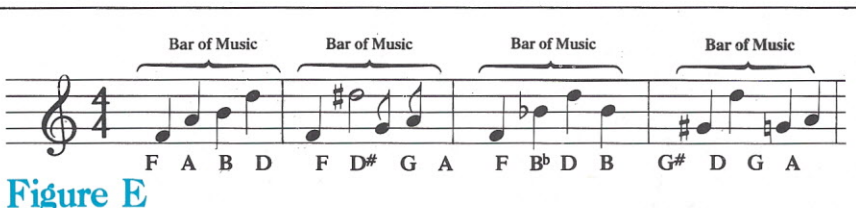
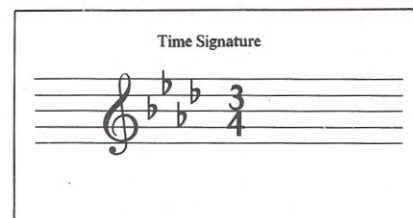


Figure E

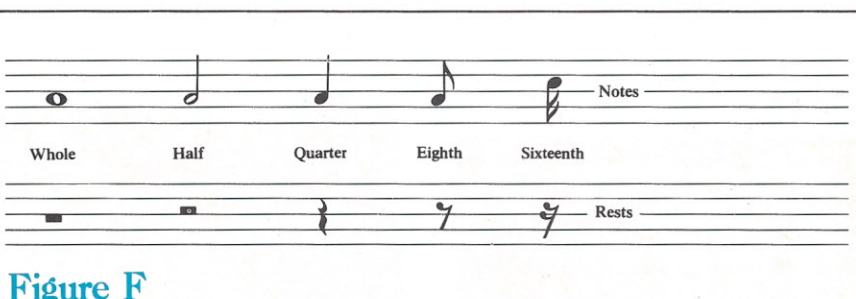


Figure F

ment is shown in Figure A. Notes that cannot be accommodated on the staff are shown with ledger lines above and below the regular staff lines.

In addition to the placement of the note on a staff, its pitch may be affected by the use of accidentals (Figure B). A sharp raises the pitch one semitone and a flat lowers the pitch one semitone. A double sharp raises the pitch one whole tone (or two semitones) and a double flat lowers the pitch of a note one whole tone. A natural cancels the affect of any previous sharp or flat.

If a group of accidentals are placed to the immediate right of the clef, they are called a key signature (Figure C). The key signature serves to affect the pitch of the notes in a tune throughout its

length. All accidentals affect only those notes that have the same letter name as the line or space on which the accidental is placed.

The fraction appearing to the right of a key signature specifies the rhythm at which a piece of music is to be played (Figure D). As this program for the TRS-80 plays all notes with equal emphasis, the time signature is of little use to us.

Music is divided into measures or bars (Figure E). A bar line can be identified quite appropriately by the vertical lines running perpendicular to the lines of the staff. For our purposes the bar serves to identify accidentals that have a limited affect upon notes. If you observe an accidental in a location other

than the key signature, it only affects the notes to the right of the accidental and only to the beginning of the next bar. Upon entering the next bar of music, the note assumes the pitch characteristics of the original key signature.

While the pitch of a note is indicated by where the note is placed on the staff, the beat value is determined by what the note looks like (Figure F). If two notes of the same beat value are placed together their stems are often joined, yet they should still be entered as two individual notes. Rests, which indicate silence between notes, are also placed on the staff. As they have no pitch we need only know their beat value, which as you can see corresponds to the beat value of the notes. The beat value of the notes and rests can be extended with the use of a dot, which extends the value of the notes or rest by an additional one half of the value shown.

You will often come across situations where it is obvious that more than one note is to be played at the same time. The TRS-80 is only capable of playing one note at a time, so we need some means of determining which note should be played. Fortunately, the melody of a song is usually the highest of the notes shown. Following this rule of thumb, you should be able to input the correct note in the majority of cases. If you're wrong the editing features of the program allow for easy correction.

The best procedure for entering tunes is to first ascertain which notes are affected by the accidentals in the key signature. Then circle the top note in the passage of music that you want to transcribe, marking those ones that are affected by accidentals not appearing in the key signature. Following this method you should find the whole process rather painless.

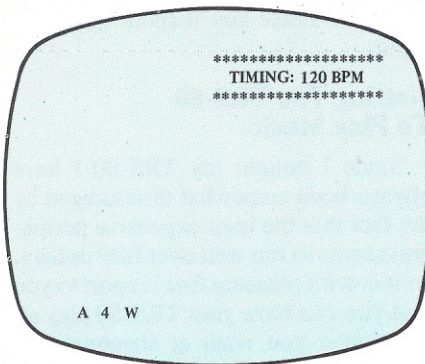
While I cannot hope that this is enough information to cover every situation you may encounter, you certainly have enough to decipher 90% of the sheet music presently published. If you do encounter problems, a reference text such as a large dictionary or encyclopedia should provide the answer to your query. Failing that, a trip to the local music store to pick up a book would not be a bad idea.

Running the Program

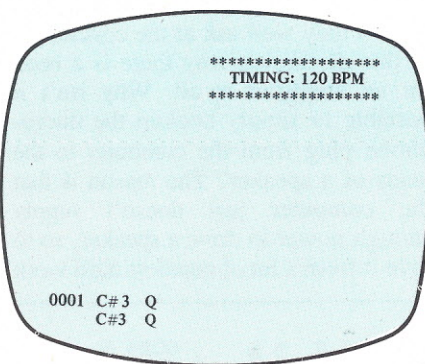
After you've typed in the program and entered RUN you will be in the Transcribe Mode, signified by the title block displaying "TEMPO: 120 BPM" (see Screen 1). The tempo means that the equivalent of 120 whole notes will be played every minute. In the Tran-

scribe Mode you can enter notes as well as transfer to the other editing and command functions of this program. The unnumbered note in the bottom left hand corner of the display may be changed to show whatever note you wish. The note currently displayed is an A in the fourth octave and it is a whole note. Pressing any key A through G (do not shift) will change the display to indicate the change. Similarly, accidentals will be shown when their assigned keys are pressed:

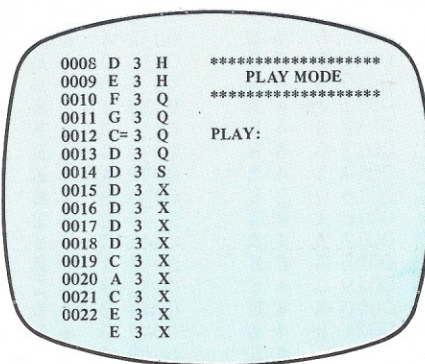
one sharp
\$ two sharps or double sharp



Screen 1: What the screen should look like after you have entered the program and typed "RUN".



Screen 2: An example of what the screen will look like after you have entered the first note.



Screen 3: Here is an indication of what the screen should look like upon entry to the play mode. At this time you could stipulate what part of the tune you want played, or set it up for continuous mode by entering C.

- one flat
- = two flats or double flat

To remove an accidental from the screen press N (for natural). Pressing an R (for rest) will cause any pitch information to disappear as it has no affect upon a rest. Pressing any pitch related key (note name, accidental or octave key) will restore the balance of the information.

Depressing the shift key at the same time you press one of the following keys will indicate the following beat values:

W whole note
H half note
Q quarter note
E eighth note
S sixteenth note
T thirty-second note
X sixty-fourth note

Note lengths may be supplemented with the dot which increases the length of the note or rest by an additional one half of the currently displayed value. The dot is added by pressing the period and is removed by pressing the period again.

When you have determined the correct note to be entered, store it by pressing Enter key. The screen responds by printing a note number beside the note you have just entered and providing you with a new line identical to the one entered, except that it will not have a note number. (See Screen 2). You may change this new line according to the previous instructions. When completed press the Enter key again and the computer replies by assigning the next sequential number to the note you just entered, providing you once again with an unnumbered duplicate to change.

You may continue this process until you've entered the total list or "score" of the notes in the tune you want the computer to play.

To play the tune press P. The display now shows you the title block indicating that you are in the Play Mode (see Screen 3). To play the entire tune press A (for all) and the Enter key. If everything's in order, the speaker should respond with sweet, sweet music.

You may play the whole song as often as you wish using the A command, but the Play Mode offers a number of other options. Pressing C (for continuous) and the Enter key will cause the computer to display "REPEAT: TIMES". You may enter any number under ten. The computer will then ask you to select the portion of the tune currently in memory that you want

played. Aside from typing in an A, you may enter a single number or two numbers separated by a hyphen. The program handles hyphenated input much in the same manner as the LIST function in Basic, playing the notes you specify as opposed to listing them. A little experimentation with this function is all you'll need to understand the different options.

After the computer has played the tune, all counters are reset and you must re-enter the information. If you do not specify how many times you want the passage repeated, the program assumes that you want the specified notes played only once.

To return to the Transcribe Mode simply press the Enter key. The computer will display the appropriate information block as well as the last fourteen notes currently in memory.

From the Transcribe Mode you can enter the following modes:

Shift C — Change Mode: Input the number of the note you want to change and it will be displayed in the bottom left hand corner of the screen. The note may be revised and stored according to the same instructions for the Transcribe Mode. When you have entered the change, the computer displays the next note currently in memory. It may be changed as well, or you may return to the Transcribe Mode by pressing the Enter key without making any changes.

Shift I — Insert Mode: Allows you to input any number of notes after the one you stipulate. Entering notes is handled in the same fashion as the Transcribe Mode. To exit the Insert Mode press the ENTER key without making changes to the note currently displayed.

Shift D — Delete Mode: Operates like the Play Mode. You may input any one number or two hyphenated numbers. As with the Insert Mode the note numbering will be adjusted so that the entire tune in memory is sequential starting from one. To delete the entire tune press A (for all) and the Enter key. To exit the Delete Mode press the Enter key without stipulating a deletion.

Shift L — List Mode: Will display the next fourteen notes from the note number you have entered.

No shift S — Save Mode: If in answer to the question "CASSETTE READY:?" you answer Y (for yes), the computer will output the entire contents of the tune currently in memory. Be sure you've removed the microphone jack from your amplifier and reinserted it in the cassette recorder.

No shift L — Load Mode: Will attempt to load a tune you previously

saved. Upon loading the tune it will automatically adjust the input to play the tune at the currently listed tempo.

No shift T — Reset Timing: To the question "BPM: ?" you may enter any number greater than 0 but less than 200. If you wish to have the tune currently in memory revised to this new timing answer Y (for yes) to the question "REDO EXISTING TUNE:?". Answering N (for no) returns you the Transcribe Mode and the length of all notes subsequently entered will be calculated using the new timing.

All modes must be entered from the Transcribe Mode. To return to the Transcribe Mode from any other mode, press the Enter key without any prior input.

Getting The TRS-80 To Play Music

Since I bought my TRS-80 I have always been somewhat discouraged by the fact that the least expensive peripheral seems to run well over fifty dollars, so it is with pleasure that I report to you that you can have your TRS-80 play all the music you want at absolutely no additional cost. Mind you, you do sacrifice some convenience with the bargain basement methods, but if you really don't want to spend a dime you certainly don't have to.

You may well ask at the conclusion of this discussion why there is a need for an amplifier at all. Why isn't it possible to simply hookup the microphone plug from the computer to the leads of a speaker? The reason is that the computer just doesn't supply enough power to drive a speaker, so to save it from a lot of needless hard work

we turn the rapid voltage changes over to an amplifier to do the heavy work of driving a speaker.

Running neck and neck for zero cost and most inconvenience are the first two methods. Things change in both convenience and cost with each of the following suggestions:

- Leave all the jacks plugged into your computer as you would were you CSAVEing. When the computer has finished playing the tune, remove the earphone jack, rewind the tape and listen to the music you have just recorded.

- Leave the microphone jack from the computer in the cassette recorder but remove the earphone plug and put in the earphone that came with the tape recorder. Apart from these changes prepare your recorder as you would were you CSAVEing. With this method not only can you hear the tune being played but you are also recording it at the same time.

Caution: The sound from the earphone jack cannot be controlled and will be very loud. To avoid temporary or permanent damage to your eardrum do not insert the earphone in your ear. Rather, hold it at a comfortable distance.

- This option allows for a certain margin of safety over the last method, though it is set up in the same way. Using a patch cord (like Radio Shack cat. No. 42-2434), wrap the bare ends (you needn't solder) around the two terminals of an inexpensive speaker. Put the plug end of the cable into the earphone jack of the recorder. Set up the computer and cassette recorder in the same manner as the last option. You

0001 G 3 E	0025 B 4 E	0049 D 4 E	0073 C 4 Q.
0002 A 4 E	0026 G 3 E	0050 B 4 E	0074 D 4 H.
0003 B 4 E	0027 F# 3 E	0051 G 3 E	0075 D 4 Q.
0004 D 4 E	0028 G 3 E	0052 A 4 E	0076 C 4 H.
0005 C 4 E	0029 A 4 E	0053 B 4 E	0077 B 4 Q.
0006 C 4 E	0030 D 3 E	0054 A 4 E	0078 A 4 E
0007 E 4 E	0031 F# 3 E	0055 D 4 E	0079 D 3 E
0008 D 4 E	0032 A 4 E	0056 C 4 E	0080 E 3 E
0009 D 4 E	0033 C 4 E	0057 B 4 E	0081 F# 3 E
0010 G 4 E	0034 B 4 E	0058 A 4 E	0082 A 4 E
0011 F# 4 E	0035 A 4 E	0059 G 3 E	0083 G 3 E
0012 G 4 E	0036 B 4 E	0060 D 3 E	0084 A 4 E
0013 D 4 E	0037 G 3 E	0061 G 3 E	0085 C 4 E
0014 B 4 E	0038 A 4 E	0062 F# 3 E	0086 B 4 E
0015 G 3 E	0039 B 4 E	0063 G 3 E	0087 C 4 E
0016 A 4 E	0040 D 4 E	0064 B 4 E	0088 A 4 E
0017 B 4 E	0041 C 4 E	0065 D 4 E	0089 F# 3 E
0018 C 4 E	0042 C 4 E	0066 G 4 E	0090 D 3 E
0019 D 4 E	0043 E 4 E	0067 D 4 E	0091 F# 3 E
0020 E 4 E	0044 D 4 E	0068 B 4 E	0092 A 4 E
0021 D 4 E	0045 D 4 E	0069 G 3 E	0093 C 4 E
0022 C 4 E	0046 G 4 E	0070 B 4 E	0094 B 4 E
0023 B 4 E	0047 F# 4 E	0071 D 4 E	0095 A 4 E
0024 A 4 E	0048 G 4 E	0072 B 4 H.	0096 B 4 E

Sample Tune: Jesu Joy of Man's Desiring — J.S. Bach

Machine Language Subroutine Listing

7FAD	00100	ORG	32685D	#LOCATION OF PROGRAM
7FFE	00110	STORE	EQU	32766D
7FAD 2600	00120	START	LD	H,00
7FAF 6C	00130		LD	L,H
7FB0 39	00140		ADD	HL,SP
7FB1 314871	00150		LD	SP,29000
7FB4 D1	00160	NXNOTE	POP	DE
7FB5 C1	00170		POP	BC
7FB6 ED43FE7F	00180		LD	(STORE),BC
7FBA F1	00190		POP	AF
7FBB 3808	00200		JR	C,SHORT
7FBD 2817	00210		JR	Z,LONG
7FBF FEFF	00220		CP	OFFH
7FC1 282B	00230		JR	Z,REST
7FC3 F9	00240		LD	SP,HL
	00250			
7FC4 C9	00260	RET		
7FC5 41	00270	SHORT	LD	B,C
7FC6 3E0D	00280		LD	A,0DH
	00290			
	00300			
7FC8 D3FF	00310		OUT	(OFFH),A
7FCA 10FE	00320	LOW1	DJNZ	LOW1
7FCC 3C	00330		INC	A
	00340			
7FCD D3FF	00350		OUT	(OFFH),A
7FCF 1B	00360		DEC	DE
	00370			
7FD0 7A	00380		LD	A,D
7FD1 B3	00390		OR	E
7FD2 20F1	00400		JR	NZ,SHORT
7FD4 18DE	00410		JR	NXNOTE
7FD6 ED4BFE7F	00420	LONG	LD	BC,(STORE)
7FDA 3E0D	00430		LD	A,0DH
7FDC D3FF	00440		OUT	(OFFH),A
7FDE 0B	00450	LOW2	DEC	BC
7FDF 78	00460		LD	A,B
7FE0 B1	00470		OR	C
7FE1 20FB	00480		JR	NZ,LOW2
7FE3 3E0E	00490		LD	A,0EH
7FE5 D3FF	00500		OUT	(OFFH),A
7FE7 1B	00510		DEC	DE
7FE8 7A	00520		LD	A,D
7FE9 B3	00530		OR	E
7FEA 20EA	00540		JR	NZ,LONG
7FEC 18C6	00550		JR	NXNOTE
7FEE ED4BFE7F	00560	REST	LD	BC,(STORE)
7FF2 0B	00570	LOW3	DEC	BC
7FF3 78	00580		LD	A,B
7FF4 B1	00590		OR	C
7FF5 20FB	00600		JR	NZ,LOW3
7FF7 1B	00610		DEC	DE
7FF8 7A	00620		LD	A,D
7FF9 B3	00630		OR	E
7FFA 20F2	00640		JR	NZ,REST
7FFC 18B6	00650		JR	NXNOTE
0000	00660	END		
00000 TOTAL ERRORS				
	REST	7FEE	LOW3	7FF2
	LONG	7FD6	LOW2	7FDE
	SHORT	7FC5	LOW1	7FCA
			NXNOTE	7FB4
			START	7FAD
			STORE	7FFE

Program Listing

```

1 REM*****
2 REM*** MUSIC TO SOOTHE THE ***
   *** SAVAGE TRS-80 ***
3 REM*****
4 REM
5 REM BY HUGO T. JACKSON
6 REM
7 REM*****
8 REM SET MEMORY SIZE TO 30867
9 REM*****
30 REM
40 REM
500 REM*INIT 1* GOTO MAIN      *
   * PROGRAM                  *
   * INITIALIZATION          *
510 GOTO 5000
1000 REM*SUB 1* DECODE NOTE   *
   * STRING                   *
1010 A8=A6(C3)
1020 A1=MID$(A8,1,1)
1030 A2=MID$(A8,2,1)
1040 A3=MID$(A8,3,1)
1050 A4=MID$(A8,4,1)
1060 A5=MID$(A8,5,1)
1500 REM*SUB 2* ASSEMBLE NOTE *
   * NUMBER STRING          *
1510 A9=STR$(C3)
1520 A9=RIGHT$(A9,LEN(A9)-1)
1530 A9=RIGHT$("0000"+A9,4)
1540 RETURN
2000 REM*SUB 3* DECODE WORKING *
   * VALUES                 *
2010 B1=C1(ASC(A1),1)
2020 B2=C1(ASC(A2),1)
2030 B3=C1(ASC(A3),1)
2040 G4=1/2C1(ASC(A4),1)
2050 IF A5=" " THEN G5=1
   ELSE G5=1.5
2060 G1=G9+6*C3
2070 ***STEP** CHECK FOR     *
   * ACCIDENTALS             *
2080 E1=B1+B2
2090 E2=B3
2100 IF E1<1 THEN E1=E1+12
   : E2=E2-1
2110 IF E1>12 THEN E1=E1-12
   : E2=E2+1
2120 IF E2>4 THEN E3=E2-1
   ELSE E3=E2
2130 ***STEP** CALCULATE     *
   * TIMING                   *
2140 E4=27.5*2CE2
2150 E4=E4*1.059643E(E1-1)
2160 E4=INT(E4*64*65*66)
2170 E5=FIX(E4/256)
2180 POKE G1,E4-E5*256
2190 POKE G1+1,E5
2200 ***STEP** CALCULATE     *
   * FREQUENCY                *
   * END                       *
   * AND SET 32               *
   * CHARACTER                 *
   * DISPLAY MODE             *
3010 CLS
3020 PRINT CHR$(23)
3500 REM*DISP 2* TITLE BLOCK *
3510 PRINT@ 30,STRING$(17,42);
3520 AB=LEFT$(AA+STRING$(17,32),17)
3530 PRINT@ 94,AB;
3540 PRINT@ 158,STRING$(17,42);
4000 REM*DISP 3* INFORMATION *
   * REQUEST                  *
4005 PRINT@ 286,STRING$(17,32);
4010 E1=17-LEN(AC)
4030 PRINT@ 286,AC;
4040 AC=" "
4050 RETURN
4500 REM*DISP 4* LIST NOTES   *
4510 IF C2=0 RETURN
4520 E1=C3
4530 IF E1<1 THEN E1=1
4540 E2=C3+14
4550 IF E2>C2 THEN E2=C2
4560 FOR C3=E1 TO E2
4570 GOSUB 1000
4580 PRINT@ 960, A9;" "A1;A2;
   " "A3;" "A4;A5
4590 NEXT C3
4600 RETURN
5000 REM*INIT 1* DEFINE      *
   * VARIABLES ETC.*
5010 CLEAR 1589
5020 DEFSTR A
5030 DEFINT B,C,E
5040 DEFSGN G
5050 DIM A6(300)
5060 DIM C1(120,2)
5070 POKE 16526,173
5080 POKE 16527,127
5500 REM*INIT 2* SETUP INPUT *
   * DECODER                  *
   * MATRIX                    *
5510 FOR E1=1 TO 120
5520 READ C1(E1,0),C1(E1,1)
5530 NEXT E1
5540 DATA 0,2478, 0,2339, 0,2207,
   0,2083, 0,1967, 0,1856,
   0,1752, 0,1651, 0,1560,
   0,1473, 0,1390, 0,1311
5550 DATA 0,0, 0,0, 0,0, 0,0,
   0,0, 0,0, 0,0, 0,0,
   0,0, 0,0, 0,0, 0,0,
   0,0, 0,0, 0,0, 0,0,
   0,0, 0,0, 2,1, 2,2
5570 DATA 0,0, 0,0, 0,0, 0,0,
   0,0, 0,0, 0,0, 0,0,
   2,-1,5,0, 0,0, 3,0
5580 DATA 3,1, 3,2, 3,3, 3,4,
   3,5, 3,6, 3,7, 0,0,
7040 ON C1(ASC(A7),0) GOTO
   7500, 7540, 7590, 7630,
   7660, 7690, 8000, 8500,
   9000, 9500,10000,10500,
   11000,11500,12000,12500,
   13000
7050 GOTO 7010
7500 REM*BRANCH 1* NOTE      *
7510 A1=A7
7520 IF A3=" " THEN A3="4"
7530 GOTO 7730
7540 REM*BRANCH 2* ACCIDENTAL *
7550 A2=A7
7560 IF A2="N" THEN A2=" "
7570 IF A1="R" THEN A1="A"
   : A3="4"
7580 GOTO 7730
7590 REM*BRANCH 3* OCTAVE    *
7600 A3=A7
7610 IF A1="R" THEN A1="A"
7620 GOTO 7730
7630 REM*BRANCH 4* BEAT      *
7640 A4=A7
7650 GOTO 7730
7660 REM*BRANCH 5* DOTTED    *
7670 IF A5=A7 THEN A5=" "
   ELSE A5=A7
7680 GOTO 7730
7690 REM*BRANCH 6* REST      *
7700 A1=A7
7710 A2=" "
7720 A3=" "
7730 REM*CHAN 1* UPDATE NOTE *
   * STATUS                   *
7740 IF C1(13,0)=10 THEN A8=A9
   ELSE A8=" "
7750 GOTO 6570
8000 REM*BRANCH 7* CR -      *
   * TRANSCRIBE              *
   * MODE                     *
8010 C2=C2+1
8020 C3=C2
8030 GOSUB 2000
8040 A6(C2)=A1+A2+A3+A4+A5
8050 GOSUB 1500
8060 PRINT@ 960, A9;" "A1;A2;
   " "A3;" "A4;A5
8070 GOTO 6550
8500 REM*BRANCH 8* PLAY MODE *
8505 PRINT@ 414, STRING$(17,32);
8510 E5=1
8520 AA="PLAY MODE"
8530 AC="PLAY:"
8540 GOSUB 3500
8550 GOSUB 2500
8560 IF A8=" "
   OR C2=0 GOTO 6510
8570 IF E1<0 OR A8="E" GOTO 8530
8580 IF A8>"C" GOTO 8640
8590 PRINT@ 422, " TIMES";
10510 IF E8=1 GOTO 6510
10520 E3=C2-E9
10530 FOR E4=E3 TO 1 STEP -1
10540 A6(C2+E4)=A6(E4)
10550 G1=G9+6*(C2+E4)
10560 G2=G9+6*(E9+E4)
10570 FOR E5=5 TO 0 STEP -1
10580 POKE G1+E5, PEEK(G2+E5)
10590 PRINT@ 748,"*";
10600 NEXT E5
10610 PRINT@ 748," ";
10620 NEXT E4
10630 C2=C2+1
10640 C3=C3+1
10650 A6(C3)=A1+A2+A3+A4+A5
10660 GOSUB 2000
10670 GOSUB 1500
10680 PRINT@ 960, A9;" "A1;A2;
   " "A3;" "A4;A5
10690 PRINT@ 960, " "A1;A2;
   " "A3;" "A4;A5;
10700 GOSUB 3500
10710 E8=0
10720 GOTO 7010
11000 REM*BRANCH 13* DELETE *
   * MODE                     *
11010 AA="DELETE MODE"
11020 AC="DELETE:"
11030 GOSUB 3000
11035 GOSUB 2500
11040 IF A8="A" THEN C2=0
   : GOTO 6510
11045 IF E1=-2 GOTO 6510
11050 IF E1<1 GOTO 11020
11060 E3=0
11070 FOR E4=E2 TO C2
11100 A6(E1+E3)=A6(E2+E3+1)
11110 G1=G9+6*(E1+E3)
11120 G2=G9+6*(E2+E3+1)
11125 E3=E3+1
11130 FOR E7=0 TO 5
11140 POKE G1+E7, PEEK(G2+E7)
11150 PRINT@ 748,"*";
11160 NEXT E7
11170 PRINT@ 748," ";
11180 NEXT E4
11190 C2=C2-E2+E1-1
11200 GOTO 11020
11500 REM*BRANCH 14* TIMING *
   * MODE                     *
11510 AA="RESET TIMING"
11520 AC="BPM:"
11530 GOSUB 3000
11540 GOSUB 2500
11545 IF A8=" " GOTO 6510
11550 IF E1<1 GOTO 11520
11560 C6=E2
11570 IF C6<0 OR C6>200 GOTO 11520

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2220 E4=INT(E4/2/E3)
2230 IF E2>4 THEN E4=E4-1
2240 E5=FIX(E4/256)
2250 POKE G1+2,E4-E5*256
2260 POKE G1+3,E5
2270 **STEP** SELECT TONE *
      * GENERATOR *
2280 POKE G1+5,255
2290 IF E2<5 THEN E1=64
      ELSE E1=1
2300 IF A1="R" THEN E1=0
2310 POKE G1+4,E1
2320 RETURN
2500 REM*SUB 4* DECODE *
      * HYPHENATED *
      * INPUT *
2510 A8="":A9="":E1=0:E2=0
2520 A7=INKEY$
2530 IFA7="" GOTO 2520
2540 IF ASC(A7)=8
      THEN A8=LEFT$(A8,ABS(LEN(A8)-1))
      : PRINT A7;GOTO 2520
2550 IF ASC(A7)=13 GOTO 2600
2560 IF POS(0)=0
      OR ASC(A7)<45 GOTO 2520
2570 PRINT A7;
2580 A8=A8+A7
2590 GOTO 2520
2600 IF LEN(A8)=0 THEN E1=-2
      : RETURN
2610 IF LEN(A8)=1
      AND A8="A"
      OR A8="C"
      OR A8="E" THEN E1=0
      : RETURN
2620 FOR E4=1 TO LEN(A8)
2630 A7=MID$(A8,E4,1)
2640 IF A7="" GOTO 2710
2650 IF ASC(A7)<48
      OR ASC(A7)>57 THEN E1=-1
      : RETURN
2660 A9=A9+A7
2670 NEXT E4
2680 E2=VAL(A9)
2690 E1=E2
2695 IF E1>C2 THEN E1=-1
2700 RETURN
2710 IF A9="" THEN E1=1
      ELSE E1=VAL(A9)
2720 A9=""
2725 E4=E4+1
2730 FOR E3=E4 TO LEN(A8)
2740 A7=MID$(A8,E3,1)
2745 IF A7="" THEN E2=C2
      : RETURN
2750 IF ASC(A7)<48
      OR ASC(A7)>57 THEN E1=-1
      : RETURN
2755 A9=A9+A7
2760 NEXT E3
2770 IF A9="" THEN E2=C2
      ELSE E2=VAL(A9)
2780 IF E1<0
      OR E2<E1
      OR E2>C2 THEN E1=-1
2790 RETURN
3000 REM*DISP 1* CLEAR SCREEN *

```

```

5590 DATA 2,-2,0,0,0,0,0,0,
      1,1,1,3,1,4,1,6,
      1,8,1,9,1,11,0,0
5600 DATA 11,0,0,0,0,17,0,
      0,0,2,0,0,0,8,0,
      0,0,6,0,16,0,14,0
5610 DATA 0,0,0,0,0,0,0,0,
      0,0,0,0,0,0,0,0,
      0,0,0,0,0,0,0,0
5620 DATA 0,0,0,9,0,13,0,
      4,3,0,0,0,0,4,1,
      11,0,0,0,0,15,0
5630 DATA 0,0,0,0,0,0,0,0,
      4,2,0,0,4,4,4,5,
      0,0,0,0,4,0,4,6
5690 REM*INIT 3* POKE MACHINE *
      * LANGUAGE *
      * PROGRAM INTO *
      * MEMORY *
5700 FOR E1=0 TO 80
5710 READ E2
5720 POKE 32685+E1,E2
5730 NEXT E1
5740 DATA 38,0,108,57,49,148,120,
      209,193,237,67,254,127,
      241,56,8,40,23,254,255,
      40,43,249,201,65,62,13
5750 DATA 211,255,16,254,60,211,
      255,27,122,179,32,241,
      24,222,237,75,254,127,
      62,13,211,255,11,120,177
5760 DATA 32,251,62,14,211,255,
      27,122,179,32,234,24,
      198,237,75,254,127,
      11,120,177,32,251,27,
      122,179,32,242,182
6000 REM*INIT 3* INITIALIZE *
      * VARIABLES *
6010 C2=0
6020 C3=C2
6030 C6=120
6040 G6=2
6050 A1="A"
6060 A2=""
6070 A3="4"
6080 A4="W"
6090 A5=""
6100 CLS
6110 PRINT CHR$(23)
6120 G9=30868
6500 REM*MAIN 1* TRANSCRIBE *
      * MODE *
6510 C1(13,0)=7
6520 AA="TEMPO:"+STR$(C6)+" BPM"
6530 C3=C2-14
6535 GOSUB 3000
6540 GOSUB 4500
6550 GOSUB 3500
6560 A8=""
6570 PRINT@ 960, A8; " "A1;A2;
      " "A3; " "
      A4;A5;
7000 REM*MAIN 2* DECODE INKEY$ *
      * INPUT *
7010 A7=INKEY$
7020 IF A7="" GOTO 7010
7030 E8=E8+1

```

```

8610 GOSUB 2500
8620 IF E1<1 OR E1>99 GOTO 8590
8625 E5=E1
8630 GOTO 8530
8640 IF A8<"A" GOTO 8670
8650 E1=1
8660 E2=C2
8670 G1=G9+E1*6
8680 E3=FIX(G1/256)
8690 POKE 32690,G1-E3*256
8700 POKE 32691,E3
8710 G2=G9+10+E2*6
8720 E3=PEEK(G2)
8730 E4=PEEK(G2+1)
8740 POKE G2,0
8750 POKE G2+1,0
8760 FOR E6=1 TO E5
8770 E1=USR(E2)
8780 NEXT E6
8790 POKE G2,E3
8800 POKE G2+1,E4
8810 GOTO 8505
9000 REM*BRANCH 9* CHANGE *
      * MODE *
9010 AA="CHANGE MODE"
9020 AC="NOTE NO: "
9030 GOSUB 3000
9040 GOSUB 2500
9050 IF E1=-2 GOTO 6510
9060 IF E1<1 OR E1>C2 GOTO 9020
9070 C3=E1
9080 GOSUB 1000
9090 C1(13,0)=10
9100 GOTO 9580
9500 REM*BRANCH 10* CR - *
      * CHANGE *
      * MODE *
9510 IF E8=1 GOTO 6510
9520 A6(C3)=A1+A2+A3+A4+A5
9530 GOSUB 2000
9540 C3=C3+1
9550 IF C3>C2 GOTO 6510
9560 GOSUB 1000
9570 PRINT
9580 GOSUB 3500
9590 PRINT@ 960, A9; " "A1;A2;
      " "A3; " "
      A4;A5;
9600 E8=0
9610 GOTO 7010
10000 REM*BRANCH 11* INSERT *
      * MODE *
10010 AA="INSERT MODE"
10020 AC="INSERT AFTER: "
10030 GOSUB 3000
10040 GOSUB 2500
10045 IF E1=-2 GOTO 6510
10050 IF E1<1 OR E1>C2 GOTO 10020
10055 E9=E1
10060 C3=E1-14
10070 GOSUB 4500
10075 C3=E1
10080 C1(13,0)=12
10090 GOTO 10690
10500 REM*BRANCH 12* CR - *
      * INSERT *
      * MODE *

```

```

11590 PRINT@414,"REDO EXISTING";
11600 PRINT@ 478,"TUNE";
11610 INPUT A8
11620 IF A8="Y" GOTO 11640
11630 IF A8="N" GOTO 6510
      ELSE GOTO 11520
11640 FOR C3=1 TO C2
11650 GOSUB 1000
11660 PRINT@ 748,"*";
11670 GOSUB 2000
11680 PRINT@ 748," ";
11690 NEXT C3
11700 GOTO 6510
12000 REM*BRANCH 15* LIST MODE *
12010 AA="LIST MODE"
12020 AC="LIST FROM: "
12030 GOSUB 3500
12040 GOSUB 2500
12045 IF E1=-2 THEN GOTO 6510
12050 IF E1<1 OR E1>C2 GOTO 12020
12060 C3=E1
12070 GOSUB 4500
12080 GOTO 12020
12500 REM*BRANCH 16* SAVE MODE *
12505 A8=""
12510 AA="SAVE MODE"
12520 AC="CASSETTE READY"
12530 GOSUB 3000
12540 INPUT A8
12550 IF A8="" GOTO 6510
12560 IF A8<"Y" GOTO 12505
12570 FOR E1=1 TO C2
12580 PRINT@-1,A6(E1)
12590 NEXT E1
12600 A6(C2+1)=""
12610 PRINT@-1,A6(C2+1)
12620 GOTO 6510
13000 REM*BRANCH 17* LOAD MODE *
13005 A8=""
13010 AA="LOAD MODE"
13020 AC="CASSETTE READY"
13030 GOSUB 3000
13040 INPUT A8
13050 IF A8="" GOTO 6510
13060 IF A8<"Y" GOTO 13005
13070 E1=1
13080 PRINT@ 748,"*";
13090 INPUT@-1,A6(E1)
13100 PRINT@ 748," ";
13110 IF A6(E1)="" GOTO 13140
13120 E1=E1+1
13130 GOTO 13080
13140 FOR C3=1 TO (E1-1)
13150 GOSUB 1500
13160 PRINT@ 748,"*";
13170 GOSUB 2000
13180 PRINT@ 748," ";
13190 NEXT C3
13200 C2=C3-1
13210 C3=C2
13220 GOTO 6510

```


won't be able to adjust the volume but at least you'll still have your ears.

- Better results can be achieved using your hi-fi system if you have access to the amplifier input. With a phono to RCA jack adaptor (Radio Shack cat. No. 42-2444) simply put the microphone plug from the computer into the jack end of the adaptor and plug the adaptor into the back of your hi-fi. If you have a stereo and want the music to come from both channels, plug the hi-fi end of your adaptor into a Y Connector (like Radio Shack cat. No. 42-2438) and plug the two ends into the left and right channel jacks in the back of your stereo.

- The most expensive but most convenient method is to use a small amplifier (like Radio Shack cat. No. 277-1008) and put the microphone plug from the computer right into the jack provided. With this method you can adjust the volume as well as leave your stereo to the task of playing records. But at a current catalogue price of \$14.95 it may well be more than you are willing to pay.

Program Notes

I think you'll find that this program is relatively easy to follow. The following

program notes should help you get the program up and running.

INIT 1: This automatically causes the program to jump to the main part of the program. The reason the subroutines are located at the beginning of the program is that when most Basic interpreters are searching for a subroutine they start at the beginning of a program and look forward. Placing the subroutines at the very beginning means Basic doesn't have to look very far.

SUB1: If we had no requirements to save the notes we had input then we would have no need for this subroutine. Most people (well, at least I do) find it easier to read music by its note name rather than by its actual frequency. So all the notes input are stored in A6, a one dimensional string array. Each element of the array is the combination of the five characteristics that create a musical note. The first character is the letter name of the note, the second character is the accidental (if there is one), the third indicated the octave, the fourth gives the beat value and fifth indicates whether or not the beat value is dotted. The MID\$ command picks apart the array elements into their component parts.

SUB2: Here we come to a subroutine

of rather dubious merit. Its only purpose is to make the video display look nice by converting the present note number into a four character string with leading zeroes.

SUB3: This subroutine is the real nitty gritty of the program. Before writing this program I determined the correct values required by the machine language subroutine to output tones of the correct pitch. These values are saved in the first twelve locations of the two dimensional matrix C1. After the actual semitone value of the note is determined (lines 2010 to 2120), the frequency of the correct octave is determined in line 2140. (The left bracket stands for exponentiation, indicated on the keyboard by an up-arrow.) In the next line, the pitch of the actual semitone is calculated by multiplying the frequency of the octave by the pitch ratio the required number of times. Lines 2160 through 2190 calculate the length of the note by the beat value specified for the note as well as by the current tempo. The calculations are poked into high memory for access by the machine language program.

To set up the tone generating loops, line 2210 gets the right value from the look up table in the first twelve locations of matrix C1 and then modifies this base value according to the octave of the specific note. This calculation is then poked into high memory.

The final portion of this subroutine provides an indicator to the machine language program as to which generator should be used in outputting the current note. Additional to the Rest generator (which is just a timing loop) the program has requirements for two tone generators owing to the fact that a single one cannot cover the full range of notes we require. Therefore we use one for notes above the fourth octave and another for notes in the lower octaves.

SUB4: This subroutine is used by various Modes of this program to simulate the LIST function of Basic. It accepts a character string and picks it apart looking for a hyphen and ensuring that any other input is numeric.

INIT 2: Perhaps the most interesting portion of the program is what I refer to as the Input Decoder Matrix. As opposed to deciphering keyboard input with multiple IF/THEN statements (which in practice was too time consuming), the C1 matrix holds values for the complete ASCII set. After a key has been pressed its value is read from the C1 matrix and if valid, is routed to the correct program location by the ON/GOTO statement in line 7040. □

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HARRY SHERSHOW — Dept. Editor
MORRIS MILLER — Chess Annotator

New Chess Products

BY TOM THROOP

At the recent 1980 Consumer Electronics Show, in Chicago, Fidelity Electronics displayed two new chess products which have been added to the Chess Challenger series: the "Voice Sensory Chess Challenger;" and the "Sensory Chess Challenger." One of the new features in the "Voice" product is that you need not enter your moves via a keyboard. Instead, when you move a piece, you first press down with the piece on the square the piece is leaving and then press down with the piece on the square to which you wish to move the piece. On the machine I played in Chicago this feature didn't work quite as well as one would wish, but it is an attractive idea, particularly if you could simply pick up the piece and set it down normally.

The machine has a 50-word vocabulary. It announces all of its moves and repeats all your moves. On demand it calls out every capture and repeats the current board position.

As to its play, you may ask it to perform at any one of 9 levels of playing skill related to the "ply" or number of moves the program can look ahead. There is also an "infinite" level in which the computer will take as much time as necessary to complete its maximum look ahead.

Another interesting feature is the storage of 64 famous games in its memory. You have a chance here to test your playing ability by attempting to figure out each move made by one of the contestants in each game. The computer keeps score of the number of first choice moves and second choice moves in which you are correct.

The standard product includes the computer with its board, the chess pieces, an electronic clock, and a carrying case. Suggested retail price for the standard product is \$360.

Optional accessories are a printer to provide a complete printout of the game (suggested retail, \$175) and a rechargeable battery pack (\$99.95).

The "Sensory Chess Challenger" has the sensory feature of the previous product, but it lacks the voice and the 64 famous games. It offers 8 levels of play and may be plugged into a wall outlet or run on batteries. Suggested retail price, \$150.

Tryom Inc., of Beachwood, Ohio, has two new chess products for the 1980 season: "Chess Champion Super System III" and "Chess Traveler." The "Chess Champion Super System III" is a very attractively packaged modularized electronic chess playing product. (See George Koltanowski's report on how it almost beat Karpov in a simultaneous game.) The basic master unit, which does the "thinking", is available by itself. You select the computer's playing strength by setting the time for a computer move (from 0 seconds to 100 hours.) It is programmed to comply with all international chess rules, including a draw after reaching the same position three times with the same player to move or after 50 moves without a piece being captured or a pawn moved.

When it is your turn to play, the computer will, if you wish, suggest what it considers to be your best move. You may accept its suggestion or decide on your own selected move. Also, you may switch sides during a game. Finally, the computer can play against itself, while you watch. An A/C adaptor is included with the master unit. Suggested retail price for the master unit is \$249.95.

A number of excellent accessories are available to add in a modular fashion to this master unit. First, there is a LCD chess board which displays current board position. Second, there is an electronic printer which prints out every move. On request, it will also print other information, such as captured pieces and taken-back moves. Whenever you wish, you may even ask for a printout of the board position at any point in the game. Third, a memory module will store a board position for up to one year! Fourth, a rechargeable power pack will power the master unit by itself for up to 5 hours or the master unit with the LCD chess board for up to

Tournament News

George Koltanowski, organizer of the *First United States Microcomputer-Chess Championship*, sends the following update:

"Great interest has been shown for this outstanding event that will take place at the Le Baron Hotel in San Jose, California, September 5 to 7, 1980.

"Micro-computers and programs expected to participate include: Itel's "TCK86"; Applied Concepts' "Boris Handroid"; Ave Micro Systems "Sargon 2.5"; John Urwin's "Mychess"; William A. Fink's "Sfinks"; Atari's "K4" and "K6". Fidelity, Tryom and a few others are also expected to be on location at the starting time, Friday,

September 5 at 6 P.M.

"Motorola has donated the first and second prizes for the highest placed **non-commercial** entries: \$350 and \$250. The tournament is being directed by Bryce Perry of Palo Alto. There will be a number of side shows and lectures. Spectators are welcome and there is no admission charge."

Though the entry deadline was July 15, 1980, because of the interest shown by a number of amateurs, the final entry data was extended. To see if you can still enter, write to George Koltanowski, 1200 Gough St. Apt. D-3; San Francisco, California, 94109. Telephone: (415) 776-6942.

Share Your Home Programs

How do *you* use your computer at home? Family finances? Budgets? Meal planning? Entertainment? Teaching the kids? Word processing? Home security? Investment planning? Helping with your *other* hobby?

Our readers are as software-hungry as you. So why not share the home applications programs you've developed? Send us an article describing your application and the program you wrote to implement it. Be sure to include a program listing and sample run.

Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications or other situations.

All submissions should be original, typed (not all CAPS), double-spaced and neat. Include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material. Also, please use a fresh ribbon on your printer for program listings and sample runs.

Feel free to call us at (617) 232-5470 if you have any questions or want to discuss specific article ideas.

Mail your manuscript to:

Don Wood
Managing Editor
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2.5 hours. Suggested retail prices for these accessories are \$199.95 for the LCD chess board and printer; \$49.95 for the memory module and rechargeable power pack. There is a savings if you buy the master unit, the LCD chess board, and the printer all at the same time.

Tryom's light portable "Chess Traveler" offers many of the special features found in more expensive products. The unit has 8 levels of play, the highest looking ahead 5 ply. Play level is changeable at any time during a game. Chess pieces are included. Suggested retail price is \$99.95.

Applied Concepts has announced three new chess products for the 1980 season: "Boris Diplomat II", "Boris 2.5 Chess Module" and "Boris Handroid." The "Diplomat" is an advanced version of the Boris dedicated electronic chess game originally developed and marketed in conjunction with Chafitz. The computer's level of play is set by selecting a time from 0 seconds to 100 hours for each move. Suggested retail price is \$99.95.

The "Boris 2.5 Chess Module" is one of the modules for the new Modular Game System developed by Applied Concepts. The Modular Game System is designed to provide a microcomputer "mainframe" that will accept any one of a number of different game modules. The three initial modules are the Boris 2.5 chess module, a blackjack module,

and a checkers module. The Modular Game System approach is an attractive one for the home consumer, who can simply add a particular game module to the basic Game System.

The Boris 2.5 chess module is the latest and most powerful version of the Boris series. Boris 2.5 has a timer to select its skill level, which you may vary from 0 seconds to 100 hours for each move by Boris. Boris 2.5 is a very personable opponent. He can display 80 different remarks during the play of a game, ranging from such things as "Hooray" and "Ready to Resign" to "I need help" and "Ah, ruthless!"

An A/C adaptor/charger is supplied with the basic Modular Game System. As an option, a rechargeable battery pack provides up to 6 hours of continuous play or 24 hours of memory storage for a board position you wish to save. Suggested retail price for the Modular Game System is \$279.95; suggested retail price for the Boris 2.5 chess module is \$69.95.

The third chess product of Applied Concepts is the "Boris Handroid." Chess pieces are picked up and moved by an automated "hand"! The computer program for the game play is the Boris 2.5 chess module described above.

Suggested retail price for the Handroid Game System is \$1099.95; suggested retail price for the Boris 2.5 chess module is \$69.95.

Sorry 'bout that

This short note from Morris Miller corrects an item that appeared in the July issue concerning a CHESS 4.9 vs. OSTRICH game. In the article, David Levy was quoted as saying he had the impression that there appeared to be a draw in blitz mode instead of the eventual loss. Spurred on by the wager of a buck, David played out the position but was unable to find the draw. Morris Miller looked at the game and, like Levy, thought he too saw the draw. Playing out the ending he did manage to find the draw and described it in *Personal Computing*. David, in the July issue, refuted Morris' argument

and showed by example that a win for white was unavoidable. Said Morris about Levy's remonstrations:

"The July issue of PC with David Levy's comment on my annotation was a shock to me. I set up the position and after going over it several times I have found Levy is right and I am wrong. My apologies to your readers. My line would have possibly won against a weak or careless player, but we can be sure CHESS 4.9 would have found the win. I will now be doubly on guard against first impressions and hasty conclusions."

Machine Responses

"I am not an officially rated player," writes Tim Hitson of 4222 B Monroe, Boulder, CO, "but I have been playing steadily this past year in informal human tournaments and against my three chess-playing programs (SARGON I and II and Z-CHESS) on the TRS-80.

"Describing a chess program as 'fast' is purely relative, because the level of play strength must also be specified. Times quoted for play levels in company manuals appear to be accurate. However, I found that I had to go to the D6 level to be sufficiently challenged by Z-CHESS. At this level the average response time is seven minutes which is too long to be comfortable and could not compete in most human tournaments. The program has one higher level of strength (D) but I was unwilling to wait for an average response time of 30 minutes.

"The display format of Z-CHESS is quite useable although the non-standard square-numbering techniques takes some getting used to. At long response times the inclusion of a 'thinking' indicator would have been very helpful. Setup of the board for problem solution or continuation of an adjourned game is very easy, however, and the 'zero board' (empty all squares) feature is especially nice.

"The program itself shows some weaknesses in its logic which could be corrected to make Z-CHESS more formidable. In a number of positions I encountered, Z-CHESS had an obvious checkmate in hand. Instead, it chose a move which stalemated me! Z-CHESS must occasionally feel sorry for its opponents and provides a charitable draw.

"In several positions, Z-CHESS unnecessarily gave up material. According to the lookahead depth claimed for these levels of play (all moves evaluated to ply 5 at D6), the program should easily have avoided these mistakes. A little tuneup could help this machine.

"Finally, the opening strategy is weak. Z-CHESS seems to prefer development of Bishops before Knights in almost every case. And it will always accept the Queen's Gambit. This, however, seems to be a weak area for all

programs I've seen which don't use opening books. Z-CHESS could benefit from inclusion of at least a 3-move book similar to the one contained in SARGON II. (The latter, by the way, is the first program I've encountered that sacrificed a piece against me and won!)

"Once into the middle game, Z-CHESS provides some interesting and challenging play and it certainly has a unique style which is discernibly different from other programs. Perhaps the addition of an opening book to Z-CHESS and an improved 'killer instinct' would turn this gentle program into a tough opponent. I would be very interested in seeing a Z-CHESS II one of these days.

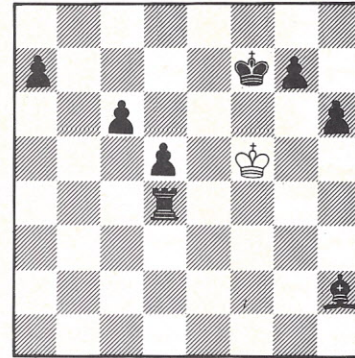
"One of my games against Z-CHESS is shown nearby."

Another reader, Robert van Maanen, of New York, has matched the cassette program (SARGON) against the stand-alone (2.5) with predictable results. "The Boris Sargon 2.5 Modular Game System is great! I wanted to see how good it was against another strong program, so I matched it up against itself (Sargon II on the TRS-80.) Both programs were set for tournament time (Level 3 for Sargon II, Level 4 for Boris 2.5) I let the two battle each other twice, swapping colors. Boris 2.5 won both games. The two played the Ruy Lopez opening. One of those games follows. It is interesting to note that in both games, Boris 2.5 took about half an hour; Sargon required an hour-and-a-half."

Commenting on these two games, Morris Miller sends along the following observation:

"Regarding my notes on the Boris-Sargon games, perhaps I may be harping on an old theme. But aside from the problem of programming end game technique, programmers must instill pattern recognition, so Boris and Sargon won't go astray in the middle game. Maybe that is asking for too much — sort of teaching instantaneous human gestalt recognition, like recognizing a situation as commonplace to us as a plaid pattern. Yet, that is how computer chess programming has to go if it is to fulfill its desire to produce a

world champion. All that is needed nowadays is some angel with about twenty million dollars."



Saved by stalemate

HITSON

White:

1. E2E4
2. G1-F3
3. D2-D4
4. F1-C4 (a)
5. C4-B3
6. O-O
7. F1-E1 (b)
8. F3xE5(c)
9. E1xD1
10. D1-E1
11. C1-G5? (e)
12. B3-F7ch? (f)
13. E5xF7
14. G5-F4
15. B1-C3
16. A1-D1
17. B2-B4
18. C3-E2
19. E2-G3
20. C2-C3
21. F4-D2
22. E1-E2
23. D1-E1
24. E2-E6?
25. E1-B1
26. D2-E1
27. B1-A1
28. A1xC1
29. E1-C3(h)
30. C3-B2
31. G3-F1
32. B2-C3
33. F1-D2
34. C3xD2
35. F2-F3
36. G2-G3
37. G1-G2
38. G3xF4
39. G2-H3
40. H3-G4
41. F3-F4
42. F4-F5
43. G4-G5
44. G5xF5
45. Stalemate! (i)

Z-CHESS D6

Black:

- E7-E5
- D8-F6
- C7-C6?
- B7-B5
- F6-G6
- G6xE4
- E4-G4
- G4xD1
- G8-H6
- F8-E7 (d)
- F7-F6
- H6xF7
- E8xF7
- E7-D8
- D8-B6
- D7-D5
- F6-F5
- B8-A6
- A6xB4
- B4xA2
- B6-C7(g)
- B5-B4
- C7-D6
- C8xE6
- B4xC3
- C3-C2
- C2-C1=Q
- A2xC1
- F5-F4
- C1-B3
- E6-F5
- F5-E4
- B3xD2
- A8-B8
- E4-D3
- B8-B1ch
- B1-B2
- D6xF4
- B2xD2
- F4xH2
- D3-E4
- D2xD4
- E5xF5
- H7-H6

BORIS 2.5
White

1. E2-E4
2. G1-F3
3. F1-B5
4. B5xG6
5. F3xE5?
6. E5-F3
7. H1-G1
8. G1-G3
9. D2-D4
10. F3-E5? (c)
11. D1-D3
12. B1-C3
13. D3xD4
14. D4-A4ch
15. C3xB5
16. A4-A5ch
17. B5-C7
18. C7xA8
19. G3-E3
20. A5-C7ch
21. A8xC7
22. C7xA6
23. E3-A3

SARGON II
Black

- E7-E5
- B8-C6
- A7-A6
- D7xC6 (a)
- D8-G5? (b)
- G5xG2
- G2-H3
- H3-D7
- G8-F6
- D7-E6
- C6-C5
- C5xD4
- (Diagram)
- C7-C5 (d)
- B7-B5?
- E8-D8
- D8-E7
- E6xE5
- F6xE4
- C8-B7
- E5xC7
- E7-D7
- D8-D6
- H8-A8

Boris 2.5 vs. Sargon II



Position after 13. d3xd4. Sargon II takes a wrong turn here.

- | | |
|-----------------|---------|
| 24. F2-F3 | E4-F6 |
| 25. A6xC5ch | D6xC5 |
| 26. A3-D3ch (e) | B7-D5? |
| 27. C2-C4 | A8-E8ch |
| 28. E1-D1 | C5-D6 |
| 29. C4xD5 | E8-E5 |
| 30. C1-F4 | E5xD5 |

- | | |
|-----------------|---------|
| 31. D3xD5 | F6xD5 |
| 32. F4xD6 | D7xD6 |
| 33. A1-C1 | D5-B4 |
| 34. C1-C4! (f) | B4-C6 |
| 35. D1-E2 | D6-D5 |
| 36. C4-G4 | C6-D4ch |
| 37. E2-E3 | D4-F5ch |
| 38. E3-D3 | G7-G6 |
| 39. A2-A3 | H7-H5 |
| 40. G4-E4 | F5-D6 |
| 41. E4-D4ch | D5-E5 |
| 42. B2-B4 | G6-G5 |
| 43. A3-A4 | F7-F5 |
| 44. H2-H3 | D6-E8 |
| 45. B4-B5 | E8-C7 |
| 46. D3-C4 | C7-E6 |
| 47. D4-D5ch | E5-F6 |
| 48. B5-B6 | E6-F4 |
| 49. B6-B7 | F4xD5 |
| 50. C4xD5 | G5-G4 |
| 51. B7-B8=Q | G4xH3 |
| 52. B8-F4 | F6-G6 |
| 53. D5-E6 | G6-G7 |
| 54. F4xF5 | H5-H4 |
| 55. F5-G4ch | G7-H6 |
| 56. E6-F7 | H3-H2 |
| 57. G4xH4 mate. | |

Regarding that Z-chess Game:

- (a) Of course the pawn is loose but no doubt white had visions of brilliance.
- (b) F3-G5 wins the rook.
- (c) Letting black off too lightly. Either 8-C4xF7ch or even 8-B1-C3 or 8-H2-H3, G4-H5; 9-C4xF7ch!: (A) H5xF7; 10-F3xE5 with a horrendous discover check winning at least a rook; (B) E8xF7; 10-F3-G5ch, F7-G6; 11-D1-D3ch, G6-F6; 12-G5-E4ch picking up the queen.
- (d) White has a piece: 11-C1xH6, G7xH6; 12-E5xF7, H8-F8; 13-F7-D6ch, E8-D8, 14-D6xC8, E8xC8; 15-E1xE7.
- (e) C1xH6!
- (f) Now 12-C1xH6, G7xH6; E5-F7 as above; or 12-... F6xE5; 13. H6xG7 wins the "ox."
- (g) 22-D1-A1 gets the knight, since black did not play B5-B4.
- (h) 29-... D6xG3; 30-H2xG3, C1-E2ch wins the bishop
- (i) A fitting punishment for not finding the mate in two: G7-G6ch and H7-H6 mate.

The Machine vs. the Cassette:

- (a) The Exchange Variation of the Ruy Lopez, rarely seen nowadays. It harks back to the famous game Emanuel Lasker vs Capablanca, St. Petersburg, 1914. White gives up the two bishops to double black's queen side pawns.

However, Niemzowitsch has shown that in this line black's two bishops give excellent chances in the end game. The main line for white is 5-D2-D4, to exchange queens; or 5-B1-C3 first, as played by Capablanca for white, years after he played black against Lasker.

(b) Better is 5-... D8-D4, forcing the exchange of queens.

(c) Premature as this permits black to undouble its pawns.

(d) This premature attack is the cause of all Sargon's later troubles. 13-... F8-D6; 14-D4-A4ch, F6-D7! and Boris cannot exchange knights as the queen and rook would be attacked. The only move is 15-F2-F4, 0-0! (better than grabbing the pawn, which would open up the range of white's bishop); 16-E5-D3, C7-C5!; 17-C1-D2 (If F4-F5, D6xG3 with check), B7-B5; 18-C3xB5, D7-B6; 19-A4-A5, B6-C4; 20-A5-A4, C8-D7, etc.

The point of this long variation, which of course is beyond the practical capacities of the two programs, is that in any complicated middle game situation (and they all are), there is no magical short cuts, it is necessary for a program to proceed on principles: avoid premature attacks, develop, avoid leaving the king uncastled on an open line, etc. Of course the old saying is as true for programs as humans, that complications favor the better player but among equals, neglect of principles invites disaster.

(e) Boris should now exchange rooks, not only because it is ahead in material but because the black rook could become too active.

(f) So that if B4xA2, C4-A4 wins the knight. And now or later white could simply give up the rook for the knight and win easily.

— By Morris Miller

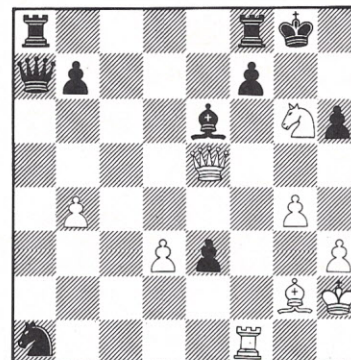
A Near Miss

When the World's Chess Champion wins a squeaker from a computer, one must agree that the machines are getting stronger. George Koltanowski relays some information he recently received:

"As reported already, Anatoly Karpov won the Bad Kissingen event with great ease (4-1/2 out of 6.) Dr. Huebner and Boris Spassky won 3 each and W. Unzicker 1-1/2. Anatoly had more trouble in a simultaneous exhibition (25 games) against 'Chess Champion Super System III'. Karpov won all 25 games, but here is one he should have lost!!

KARPOV	SUPER SYSTEM III
White	Black
1. P-QB4	P-K4
2. N-QB3	N-QB3
3. P-KN3	B-B4

4. B-N2	N-B3
5. N-B3	O-O
6. O-O	P-Q3
7. P-Q3	B-K3
8. P-QR3	P-QR4
9. P-R3	Q-K2
10. R-N1	B-B4
11. B-N5	K-R1
12. N-Q5	Q-Q1
13. P-QN4	PxP
14. PxP	B-R2
15. R-R1	P-R3
16. BxN	PxB
17. Q-Q2	K-R2
18. N-R4	B-K3
19. B-K4ch	K-N2
20. P-N4	N-Q5
21. K-R2	N-N6
22. Q-N2	NxR
23. P-K3	P-B3
24. N-QB3	P-Q4
25. PxP	PxP
26. B-N2	P-Q5
27. N-N5	Q-N3
28. NxB	QxN
29. P-B4	PxKP



Position after 32. N-N6. Black to move.

30. PxP	PxP
31. QxPch	K-N1
32. N-N6	KR-Q1??(a)
33. Q-R8 mate	

(a) The computer blunders here. With 32... Q-N1; White would be lost. If 33.N-K7ch, K-R2; 34.B-K4ch, P-B4; 35.QxQ, RB1xQ; 36.PxP, B-B2; 37.P-B6ch, K-R1 and wins! Even World Champions are lucky, sometimes!"

Sargon II: A Human View

BY LYNN L. BEAVERS

(It seems to me the average reader trying to decide whether or not to purchase a chess program is most interested in whether it will give him a challenging opponent when he wants one. This article answers this question for Hayden's Sargon II. The game that is analyzed is fairly short, full of fireworks, and reveals Sargon's strengths and weaknesses. The quality of such an analysis depends heavily on the analyst's understanding of the game, and on his understanding of what the social player wants from an opponent. I played tournament chess for several years. My USCF rating of 1690 generally placed me around the middle of the distribution in open tournaments. I enjoy playing people of any ability, so I have developed a feel for the type of game social chess players play and enjoy. In the article, I evaluate Sargon's game against that experience. For example, I have avoided the standard observation that the program

seems to have no long-range game plan. Most social players don't either.)

Advertisements for chess programs emphasize their record against other programs. Since customers are people, not other programs, the reader is invited to conclude that if the program can beat other programs, it will challenge him too. If he is familiar with how the play of the other products compares with his own, he knows roughly what to expect. If not, he has no way to relate the program to his own ability.

Such a player needs a human view. He needs to see how the program plays against a human player good enough to push it to its limits, but not so good that as a reviewer he can no longer evaluate it from the viewpoint of its probable customers.

And who are those customers? Generally social players ranging in ability from beginner to low-rated tournament-caliber player. A middle-rated tournament player will generally beat

available microcomputer programs without great difficulty, so if he purchases one it is probably out of curiosity. By contrast, the social player is looking for a challenging game at his convenience.

Sargon II delivers. It plays aggressively, showing flashes of what might be called imagination in a human player. The errors it makes are comparable in subtlety to those of an average social player. It does not beat itself with obviously stupid moves, the human player must beat it.

The following game I played against Sargon II (White) gives a good idea of the program's quality of play. All but two moves of the game were played with the program set to level 5, the next-to-highest level of play. This is probably the highest practical computer skill level for all but the most patient human players. According to the Sargon II User's Guide the average time per move at level 5 is 40 minutes; but at level 6 this increases to 4 hours — with actual time ranging between one-third and three times these values. In

the game below the two moves made at level 6 are noted "(L6)" following White's move.

SARGON II (L5) L. BEAVERS

White	Black
1. e2-e4	d7-d5
2. e4xe5	g8-f6
3. f1-b5 check	c8-d7

These moves follow opening theory for the Center Counter defense. White should now play to capitalize on his temporary pawn and Black's cramped position. But,

4. b5xd7 check	d8xd7
----------------	-------

Sargon trades a strong bishop for a weak one, increases pressure on his own pawn, and helps Black free his position. Probably the program incorporates the usually good rule that when you are ahead in material you should trade pieces. I suspect that the average social player would have made the same move.

5. g1-f3	f6xd5
6. 0-0	b8-c6
7. d2-d4	0-0-0

Both sides have been developing pieces, which is what the opening is for. But White now faces a problem: where does he put his queen's knight and queen's bishop?

8. c1-g5	f7-f6
9. g5-c1?	

Why move the bishop out, and then back home again? I was planning 9 g5-h4 g7-g5, 10 h4-g3 h7-h5, 11 h2-h3 g5-g4, and I suppose that Sargon didn't like the looks of this. Still, the bishop could have gone to d2 or even e3.

9. ...	d5-b6
10. b1-c3	g7-g5
11. d4-d5	c6-b4

With its tenth move Sargon is offering me the queen's pawn. This is not an altogether unreasonable idea. The pawn would be somewhat troublesome to defend, and by sacrificing it White can exchange off Black's queen and Knight (c6) and leave a position that would be difficult for Black to win.

I decided instead to begin a pawn-storming

attack on White's Kingside. since the hour was late and the game had reached a critical stage, I reset Sargon to level 6 and went to bed. I awoke to a surprise.

12. c1xg5 (L6)

After several hours "thought" it has decided to trade a bishop for a pawn? Not quite.

12. ...	f6xg5
13. d1-d4 (L6)	e7-e5
14. d4xe5	f8-d6
15. e5xg5	

At level 6 the computer searches at least six half-moves deep, so we can suppose that it evaluated this position when it sacrificed the bishop. Material stands about even, since Sargon was able to get three pawns for the bishop. This material equality is only temporary, since Black could recover at least one of the Pawns with b4xc2. But White has liquidated Black's Kingside pawn attack and completed the development of his pieces. I have seen aggressive and imaginative social players make just this kind of sacrifice.

On the minus side, White's game is now strategically lost. By clearing away Black's pawns, Sargon opens its king to attack from Black's major pieces — particularly the rooks.

15. ...	h8-g8
16. g5-h5	b6xd5
17. c3xd5	b4xd5
18. f3-e1	

This is a very good move. First, Sargon wisely refrains from 18 h5xd5, because then d6xh2 (check) wins White's queen. Second, it correctly identifies g2 as its most vulnerable square and moves to defend it. As a result my next move has much less force.

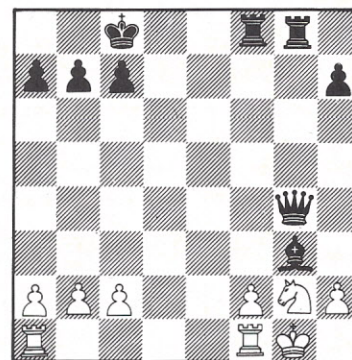
18. ...	d5-f4
19. h5-f3	d8-f8
20. f3-e3	

White's last move was forced. Black was threatening to win the queen with 20 ... f4-h3 (check), 21 f3xh3 d7xh3, and White can't retake because that would put his king in check from the rook.

Unfortunately, White's queen is lost anyway.

20. ...	f4xg2
21. e1xg2	d7-g4
22. e3-g3	d6xg3

A Social Blunder



Position after Black's 22nd move.

The threat after Black's twenty-first move was 22 ... g4xg2 (mate). The only way to prevent this is to interpose White's queen as Sargon did.

The game lasted only another ten moves.

23. h2xg3	h7-h5
24. g2-e3	g4-h3
25. f1-e1	h5-h4
26. g3-g4	f8-f3
27. a1-b1	

This totally aimless move may be as close to frustration as a computer ever gets. There is nothing it can do to improve its position.

27. ...	f3xe3
28. e1xe3	g8xg4 check
29. e3-g3	h4xg3
30. f2xg3	g4xg3 check
31. g1-f2	h3-h2 check
32. f2-e1	g3-g1 checkmate

Sargon lost primarily because it didn't see its vulnerability after the bishop sacrifice on move 12. I think many social players would have chosen the same course. It was a fairly subtle error, and it required aggressive play on Black's part to capitalize on it.

This program will make the average social player work to beat it.

On The Science of Chess-Thinking

A Book Review BY HARRY SHERSHOW

In April of 1978 a group of computer scientists specializing in artificial intelligence gathered at Edinburgh University to consider the progress in computer chess. Their topics ranged from a discussion of the human thinking process to intensive analyses of computer-chess programs.

Professor M.R.B. Clarke, lecturer in Computer Science at Queen Mary College, London, chaired the meeting. At its conclusion, Prof. Clarke sifted through the material, extracted some of the paramount topics and last year edited a book titled, "Advances in Computer Chess 1." This year he made another search through the remaining material and from that collection he has edited "Advances in Computer Chess 2," recently published by the Edinburgh University Press.

After studying this book, one is led to the obvious conclusion that chess is an inexplicable challenge to the human mind. It is remarkable that a game as simple as chess (six-year-old children have become its masters) can have such a scientific, mathematically-complex explanation. Although Computer Chess "2" is not a detailed outline on how to write a computer chess program it is a valuable guide. The book illustrates, with neat examples, the logic embedded in a computer-chess pro-

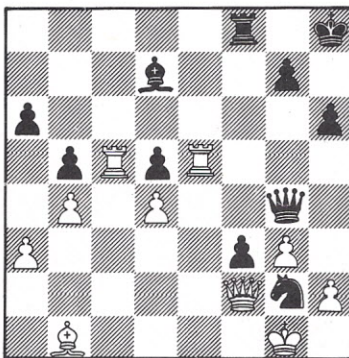
gram. Editor Clarke claims in his introduction: "Many of the papers in this book will offer as much to the active chess player as to the theoretician." The following examples support his claim.

"The Behavior of a Chess-Combination Program Using Plans," is the title of a chapter written by J. Pitrat (of France.)

"Our special program," writes Dr. Pitrat, "aims to find a combination in a given position. The program has a definite idea of such a combination and tries to realize it. If there are sacrifices in the first moves of the combination, it is not very difficult to prove that the player wins if the opponent captures the sacrificed pieces. The problem begins when the sacrifices are not accepted and the opponent counterattacks."

The author shows how his program finds a combination that leads to a mate in five moves after the opponent has accepted the sacrifices. This mate-in-five solution by the computer required 22.35 seconds and considered 4870 "plans" developed in its logic. The moves of that computer solution were:

A Mate-in-five Problem



With White to move, computer finds a combination play.

- | | |
|-------------|--------|
| 1. h2-h3 | Qg4xh3 |
| 2. Qf2xf3 | Rf8xf3 |
| 3. Rc5-c8+ | Bd7xc8 |
| 4. Re5-e8+ | Rf3-f8 |
| 5. Re8xf8++ | |

Among the book's many excellent offerings is the one on the MASTER program. MASTER is England's championship computer-chess program. Its authors are P. Kent (of the Rutherford Labs) and J. A. Birmingham (of Harwell's nuclear lab.) The two wrote the paper which describes the MASTER chess program.

Parameters of Human Brain Function

Rate of information transmission along any input or output channel	30 bits per second
Maximum amount of information explicitly storable by the age of 50	10^{10} bits
Number of mental discriminations per second during intellectual work	18
Number of addresses which can be held in short-term memory	7
Time to access an addressable 'chunk' in long-term memory	2 seconds
Rate of transfer from long-term to short-term memory of successive elements of one 'chunk'	3 elements per second

(Estimation errors can be taken to be around 30 per cent.)

"Chess players," they say, "probably maintain a tactical balance subconsciously. It is only when this balance is disturbed that the move is considered tactical. However, if a computer is to play a semblance of a sensible game of chess it has to maintain this balance by some device or other. This, we believe, is why pure tree-searchers have in the past tended to outperform positional programs. In MASTER we've tried to maintain this tactical balance by:

- Computing swap-offs on the squares of each piece.
- Extreme pessimism at the final ply evaluation.
- Forcing all captures and checks into the tree search."

Another outstanding paper is "A Representation of Pattern-Knowledge in Chess Endgames." It is the work of I. Bratko and D. Michie of the University of Edinburgh.

"Faultless machine play," they have written, "requires the evaluation of a function that has too bulky an *extensional* representation (more than 10^{45} MB) to make into a database. It also requires too long-running an *intentional* representation (about 10^{90} years on a μ ms machine) for use in the form of a lookahead program. However, it can be demonstrated that an evaluative device of impressive accuracy is constructible. Possibly even a completely accurate device could be built. Biological evolution has not done this. But why should it have? It has given the world many masterly flying creatures but has not yet achieved supersonic

flight." They have compiled from various sources an interesting table which is described as an "estimation" of the parameters of the human brain functioning as an information processor (See table above).

"Advances in Computer Chess 2" is, (like its sister volume, "Computer Chess '1'"), an excellent book for the programmer who wants to write a chess program and who needs to know some of the basic propositions in the related mathematical analyses.

It is an indispensable guide for anyone who simply wants to know how the computer can play the thinking man's game of chess.

It is a helpful book for the player who wants to improve his own chess game by learning the "science of chess thinking."

This 142-page hardcover book is available from Edinburgh University Press, 22 George Square, Edinburgh EH8 9LF UK. List price is £7.00. (Your bank will tell you how much that is at current rates.)

Our own favorite chess-book reviewer, Floyd R. Kirk, has seen this book and has drawn a fine tooth comb through it with the following observations: "The subject matter and the authors offer valuable information in their choice of subject matter. However, there are some omissions and a few vague references that should be pointed out in the hopes that they will be clarified in a further edition. For example, on page 19 (Appendix 4) of 'Construction of Economical and Correct Algorithms for King and Pawn

Against King,' authors Beal and Clarke miss some points. They list certain patterns as having one to four positions corresponding to them. This presentation does not make sense unless the reader realizes that they are considering only positions where the pawn is on one of the files 'a' through 'd'. (Positions where the pawn is on one of the files 'e' through 'h' may be reflected across the middle of the board.) This point was not made in the text. Another oversight

appears in 'How Hard is The Play of King-Rook-King-Knight Ending?' by Kopec and Niblett. The authors state that they had found several cases where Fine, in his Basic Chess Endings, had not found the shortest path to a win. I would have liked a fuller description of those positions and the shortest paths. They also said Fine erred twice in predicting the theoretical value of a position. But they listed only one such position. The main weakness seems to

be the omission of proper references or the absence of data pertaining to references. But these omissions in no way detract from the value of the book. People who read reviews should always bear in mind Samuel Taylor Coleridge's comment: 'Reviewers are usually people who would have been poets, historians, biographers, etc., if they could. They have tried their talents at one or at the other and they have failed. Therefore, they turn critics.' "

Classifieds

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Othello Tournament Results

Hayden Book Company (Rochelle Park, NJ,) bursting with excitement over the accomplishments of its top game programmers (Dan and Kathe Spracklen) rushed out the following bulletin at the termination of the Othello Tournament at Northwestern University, June 19:

"By the skin of their teeth, humans managed to hold their ground in a contest against computers at an Othello Tournament held at Northwestern University. Object of the tournament, according to Peter Frey, Tournament Coordinator, was to find which computer program plays the best against humans.

"The superlative game program turned out to be a program written by Dan and Kathe Spracklen of San Diego. The Spracklens have previously attained computer game notoriety with

their championship micro-computer chess program, Sargon II.

"The Spracklens' program and five other computer entries were brought to Evanston as opponents to two of the world's reigning human Othello champions. Rivals in the computer program were world Othello champion Hiroshi Inoue and U.S. Othello champion Jonathan Cerf, son of the late Bennet Cerf, author and publisher. Inoue defended his title against Cerf and the 6 computer programs. He lost only one match to an IBM 370, programmed by the team from England (which was later defeated by the Spracklens' program). Mr. Cerf, in addition to losing his match with Mr. Inoue, succumbed to only one computer game — the Spracklens' entry. The Spracklens' game was victorious over Cerf by a 14 piece difference.

"Othello, a game of trickery and traps, has been enjoying mounting popularity in the U.S. since Gabriel Industries was licensed to sell the game on this continent under that name in 1976. The game is not really new, but rather, it is based on Reversi, a game that has been popular in Europe since the 19th Century. Technology and tradition were wed in 1978 when Dr. Arthur Samuel introduced the first successful computer strategy game of this type to Video Brain Inc., under the name Vice Versa.

"Since that time, several other programs have been developed, but none have been as successful at defeating masters as the Spracklens' program has been. Currently, their program is in production at Hayden Book Company and will be available to the public for Christmas."

Northwestern's Man-Machine Othello Tournament

BY PETER W. FREY

(A personal account of the behind-the-scenes activity of a computer-Othello tournament.)

Several months ago, David Levy suggested a match between our Othello programs when he would be in Chicago in June. Since I was also interested in determining the strength of my Othello program, I quickly agreed to his pro-

posal. I suggested that we seek other contestants and possibly organize a tournament. Apparently the timing was right because we soon learned that many other Othello programs were available. Within a short time we had a full-fledged tournament which included 6 strong programs and two very strong human players, (the world champion and the U.S. national champion.)

The tournament was set for June 19 at the Norris University Center, Northwestern University, Evanston, Illinois. Round-robin pairings were employed with each of the contestants playing all seven opponents. The tournament generated quite a bit of pre-game excitement because it appeared to be a true horse race. We had no reason to believe that any one program had a competitive edge on any other. Levy's program had easily won an Othello tournament held the month before in

Paris. Tom Truscott's program from Duke had won a tournament held several months before in Canada and had tied for first in a tournament held a few days before in Delaware. The Carnegie-Mellon program had received considerable publicity in the February issue of *Scientific American* which described it as being strong enough to beat any human player. Not much was known about the Spracklens' program but Dan and Kathe were thought to be serious contenders because of their experience in chess programming. The unknowns in the tournament were a program by Peter Natchwey, a U.S. naval officer stationed in Newfoundland and one by myself.

Highlight of the event was the participation of both Hiroshi Inoue, (current world champion who was coming all the way from Japan just to compete with our programs,) and Jonathan Cerf, (second in the world and

News on "Intelligent" Games of Backgammon, Checkers, Gomoku, Go, etc., welcomed by this department. Computer Chess and Computer Bridge appear separately. Address all correspondence to Computer Games Dept., Personal Computing.

the current U.S. champion.) No one knew how the programs would do against such strong human competition. Some believed that the human players would prove to be no match for the computers. This speculation was reinforced by news a few days before the tournament that David Levy's program would be running on an IBM 370/168 system by telephone hookup to the University of Illinois at Chicago Circle. This news did nothing to encourage the Spracklens who were running their program on an Apple, or myself (using a Radio Shack TRS-80.)

The night before the tournament, my wife and I had a social get-together for the principals since many of them had not met each other in person. This turned out to be a lively affair with the conversation among the contestants resembling the guarded questions and answers of secret agents trying to gain more information than they disclosed. I learned a great deal in my conversations with Jonathan Cerf and Hiroshi Inoue (through his interpreter). It was very clear that they knew a lot more about Othello than I did. I was also concerned to learn that Jonathan Cerf had played the Spracklens' program about two weeks before and had given considerable advice after demolishing their program. I learned the next morning that Dan and Kathe had craftily reworked their program extensively on the basis of Cerf's advice. The results of the tournament demonstrated the value of these changes.

Tournament day arrived with everything in order and everyone tense with the excitement of the approaching event. Many man-hours had been devoted in preparation for the tournament and each programmer had the gnawing fear that a tiny flaw hidden somewhere within the complex depths of the program might unexpectedly rear its ugly head at some critical moment and blunder away an important match, or even worse yet, enter into a self-destruction sequence as everyone looked on in unsympathetic glee. By 9:30 AM communication links had been established by Duke, Carnegie-Mellon, and the London group (Levy-Reeve-Stean) to their host computers. The micros were up and ready for action. The display boards and results board were positioned properly. The

8	55	20	16	17	15	18	32	56
7	52	51	5	7	10	19	57	28
6	40	24	6	4	1	2	11	22
5	35	39	9			3	12	25
4	38	30	29			13	23	21
3	46	41	33	37	14	8	31	26
2	59	58	45	36	27	53	49	34
1	60	48	43	44	47	42	54	50
	A	B	C	D	E	F	G	H

The Spracklens (notorious giant killers in computer chess) live up to their reputation by defeating US Othello Champ, Jonathan Cerf 39 to 25. That epochal game is shown above. The Spracklens' program plays black and goes first. Moves are shown on the board in the order of play.

human contestants, who had waited patiently while all these technical matters were resolved, were clearly anxious for the event to begin. Three rounds were completed during the morning and four more after lunch.

The morning rounds seemed to establish a clear trend. Inoue and Cerf systematically destroyed all their opponents. Inoue defeated Natchwey, myself, and the Spracklens by lopsided scores of 54-10, 46-18, and 53-10, respectively. Jonathan Cerf defeated Carnegie-Mellon, Duke, and the London program by scores of 50-14, 45-19, and 58-6. With the tournament less than half completed, every program had been defeated at least once. The best records were held by the Spracklens' program and by the Carnegie-Mellon program, with 2 wins and 1 loss each.

When we broke for lunch, it appeared that the humans had nothing to fear from the machines and both Inoue and Cerf enjoyed their meals and relaxed with considerable satisfaction after the morning's victories. When competition resumed after lunch, however, they were destined for some rude shocks. Both human players displayed a post-lunch lapse as Inoue dropped his match to the London program while Cerf lost to the Spracklens' program. It is not clear whether these losses reflect the strength of the programs or simply a combination of overconfidence by the humans and an oversupply of blood to

the digestive organs in lieu of the brain. Whatever the explanation, everyone at the tournament was truly amazed and the programmers were clearly infused with new hope. Maybe we had a chance after all. The humans were hardly pleased with these results and their later play indicated that they had no intention of being part of any repeat performances. In rounds 6 and 7, they handily defeated their mechanical opponents and proceeded to the final round with identical 5 and 1 records. The last match in which Cerf and Inoue would meet head-to-head would decide the winner of the tournament. It was a hard fought contest with neither side seeming to gain an advantage during the first two-thirds of the battle. As the last middle-game was reached, the two champions appeared to have equal mobility although Inoue seemed to have a slight edge positionally. In the next few moves, he skillfully exploited this small advantage to the point where he could offer Cerf a corner with impunity. If Cerf accepted the corner, Inoue would then win another corner plus an entire edge. From that point on, Cerf's position rapidly deteriorated and he eventually lost by a score of 43-21. Inoue had successfully retained his world championship.

The tournament also provided information as to the relative strengths of the computer programs. In competition with other computers, the Spracklens' program and my program had the best records. The Spracklens had 4 wins, 1 tie, and no losses. My program had 4 wins and 1 loss. In head to head competition, the Spracklens' program won a fairly close match, 38-26. The tie came in the match with the Carnegie-Mellon program. In overall piece differential, the Spracklens' program had an edge of 233-86 in matches with the other 5 programs. On this same measure, my program had a score of 243-77. The Carnegie-Mellon program placed third in the computer competition. The London group was fourth, Natchwey was fifth, and Duke was sixth.

At the completion of the tournament, a brief closing ceremony was held. The winner, Hiroshi Inoue, received two prizes: an autographed, bound set of the first 3 volumes of Byte magazine donated by Byte Publications of Peterborough, New Hampshire and a Modu-

Northwestern Man-Machine Othello Tournament

Contestant	Opponent								W	L	T	Piece Count
	1	2	3	4	5	6	7	8				
1. Hiroshi Inoue	—	53-10	43-21	46-18	43-21	30-34	54-10	55-8	6	1	0	202
2. Spracklen Program	10-53	—	39-25	38-26	32-32	56-7	54-10	53-11	5	1	1	118
3. Jonathan Cerf	21-43	25-39	—	37-27	50-14	58-6	60-4	45-9	5	2	0	154
4. Northwestern Program	18-46	26-38	27-37	—	51-13	56-8	57-7	53-11	4	3	0	128
5. Carnegie-Mellon Program	21-43	32-32	14-50	13-51	—	54-10	49-15	46-18	3	3	1	10
6. London Program	34-30	7-56	6-58	8-56	10-54	—	35-29	42-22	3	4	0	-163
7. Nachtwey Program	10-54	10-54	4-60	7-57	15-49	29-35	—	34-30	1	6	0	-230
8. Duke Program	8-55	11-53	19-45	11-53	18-46	22-42	30-34	—	0	7	0	-209

lar Game System which serves as a strong electronic opponent for chess (Sargon 2.5), checkers, and, within a few months, Othello. The Modular Game System was donated by Applied Concepts, Inc. of Garland, Texas. Inoue accepted both of these prizes graciously. Despite the language barrier, both items are likely to be used often since Inoue is a computer programmer by profession. The tournament director, Barry Schwartz, on behalf of Gabriel Industries which manufactures Othello sets in the United States, gave each of the contestants a handsome Othello set as a memento of the tournament. The success of the tournament was in no small part due to the wonderful cooperation we received from Gabriel Industries.

With the exception of the Spracklens, none of the computer programmers had had any experience with world-class Othello competition prior to the tournament. In this respect, the individual contests and contacts were immensely educational and all of us learned a great deal. All of the programmers left the tournament with many ideas for improving their programs. On the basis of their enthusiasm, it is clear that we should have another tournament within a short time. I anticipate that all of the programs will be much stronger the next time around.

In order to reduce the cost of future tournaments, we should limit participation to microcomputer systems. In the

absence of telephone hookup and long-distance charges, tournament expenses could be quite reasonable. In addition, the Northwestern tournament clearly indicated that micros can compete effectively with the mainframes. The largest computer in the tournament was an IBM 370-168 system used by the London group. This system succumbed to the Spracklens' Apple by a score of 56-7 and lost to my Radio Shack TRS-80 by a score of 56-8. Apparently, access to a big machine isn't everything. Sorry about that IBM.

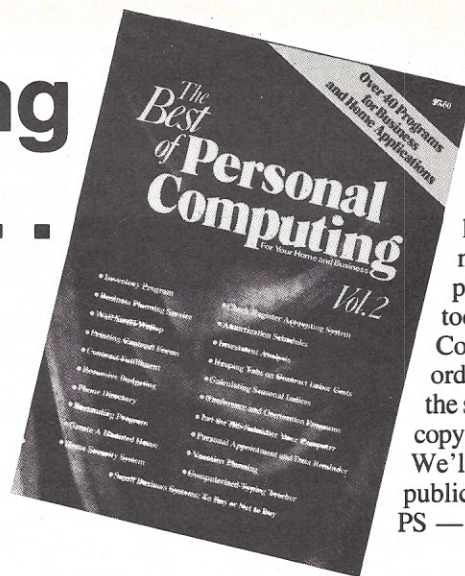
A reasonable definition of a micro is a system which can be located at the tournament site and moved about easily from one table to another. The system should also have a retail cost of less than \$3000. Within this environment, we should be able to stage some excellent tournaments which do not require major funding. In organizing the present tournament, I received letters from individuals all over the world who wanted to enter. Because we had planned a round-robin format, it was not possible to accept all entries. Hopefully future tournaments will correct this injustice by accepting everyone. In a microcomputer environment, this should not pose any significant problems. I expect that there are many Othello programmers across the country who are eagerly awaiting an opportunity to show their stuff. Let us all hope that they get that chance reasonably soon. I will be on leave at the

University of California at Santa Cruz next year and will try to organize a computer Othello tournament on the west coast this fall.

Got an unusual application?

If you use your computer for an interesting, intriguing or unusual application (or know someone who does), our readers would like to hear about it. Why not write up a short (500 to 1000 words), original article telling us about it? Make it light and newsy, and include black-and-white photos if appropriate. Send your submission to Random Access, Personal Computing, 1050 Commonwealth Ave., Boston, MA 02215.

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PC-9

Bridge Comes to The Source

BY THOMAS A. THROOP

The Source has announced the first computer bridge products now available on its system. The Source is a national computer network that provides a number of information services, lessons in a variety of subjects, and several games to play against. These are all available to anyone with a simple terminal screen and a telephone coupler. I suggest that those of you interested in connecting to The Source write or call the Telecomputing Corporation of America, 1616 Anderson Road, McLean, VA 22102 (703) 821-6660.

The first three bridge products to be announced by The Source are:

1. Autobridge. You play bridge against the computer on specific deals designed to challenge your bridge ability.

2. Bi-Monthly Bridge Column. A bi-monthly bridge column presents a problem hand in each column, the solution to which is discussed in the next column. Prizes are awarded to those submitting the best solutions.

3. Bridge Glossary. This is a very extensive glossary of bridge terms related to both the bidding and the play.

Let's look at the first product in more detail and see how it works. Once you are connected to The Source and wish to Autobridge, you type "DATE AUTOB1" at your terminal. The program asks you if you wish instructions and will print them out if you request them.

As South, you are the declarer in each deal at a contract specified by the computer. You are shown your cards and those of the dummy, North. Your objective is to make the stated contract with the North and South cards, while the computer is defending with the East and West cards. You may play each deal while seeing only the North-South cards, as in a real bridge game, or you may see all four hands while you play the cards.

At each play from the North and South hands, you are given three chances to come up with the preferred play. Should you not be able to select this play after three choices, the com-

puter will tell you what is the preferred play. This play is made and you continue with the play of the deal. The deals are chosen to provide you with an instructive situation in each deal. New deals will be continually added to The Source Autobridge, providing you with many hours of enjoyable and tutorial bridge playing.

Let's look at a couple of the initial deals. The first one we'll discuss is deal number 3. The contract to play is 4 diamonds. If you are a present Source user, why not play the deal yourself before reading further. For those of you who do not have access to The Source, here are the North and South cards:

NORTH
(Dummy)

♠ A2
♥ Q75
♦ 964
♣ K9872

SOUTH
(Declarer)

♠ JT976
♥ AJ2
♦ KQT32
♣ —

The Source, as West, opens the 3 of hearts against your 4 diamond contract. You play the 5 from dummy, The Source, as East, plays the ten, and you win with your jack. Now, how should you play this hand?

There are two important points in the play of this deal. Both the trump suit and the spade suit must be played correctly. In the trump suit you should plan to lead (perhaps twice) from the dummy up to your diamond honors. If the East-West spades are divided 3-3, you will be able to set up your spades with only one spade ruff in dummy, but you should plan your play to cater to the case where the spades are divided 4-2 with West having a doubleton honor.

Therefore, at trick 2, the proper play is to lead the jack of spades from your hand, planning to let it ride if West does not cover. West does cover, however, with the king, which you take with

dummy's ace. Now in dummy, you should lead a small trump, East plays the 7, and you play the king, which wins. Now, at trick 4, you must concede a spade to prepare to reach dummy with a spade ruff if the enemy spades and diamonds now outstanding are favorably distributed. You should lead the spade 9 (West might be asleep and duck if he holds the queen) which East wins with the queen.

East returns a heart, which you win with the ace. Now, if the two outstanding spades are split or are both in one hand with the jack of diamonds in the same hand, you will be able to enter the dummy with a spade ruff. The latter turns out to be the case; on your lead of the spade 6, West shows out but does not ruff with the diamond jack, discarding instead the 3 of clubs. You are now in dummy, after ruffing with dummy's 6 of diamonds, to lead diamonds again through East. On the 9 of diamonds lead from the dummy, East plays the ace and then shifts to the queen of clubs, which you trump with the 3 of diamonds. Now you draw East's trump jack with your queen, cash your good spades, and concede the last trick to West's king of hearts. You have made your contract, losing only one spade, one heart and one diamond.

The complete deal and the play of the cards just described are:

NORTH
(Dummy)

♠ A2
♥ Q75
♦ 964
♣ K9872

COMPUTER
WEST
♠ K4
♥ K983
♦ 85
♣ AT643

COMPUTER
EAST
♠ Q853
♥ T64
♦ AJ7
♣ QJ5

SOUTH
(Declarer)

♠ JT976
♥ AJ2
♦ KQT32
♣ —

	W	N	E	S
Trick 1	3H	5H	TH	JH
2	KS	AS	3S	JS
3	5D	4D	7D	KD
4	4S	2S	QS	9S
5	8H	7H	4H	AH
6	3C	6D	5S	6S
7	8D	9D	AD	2D
8	4C	2C	QC	3D
9	6C	7C	JD	QD
10	TC	8C	6H	TD
11	9H	QH	8S	TS
12	AC	9C	5C	7S
13	KH	KC	JC	2H

Contract: 4 diamonds

Tricks N-S: 10 Tricks E-W: 3

The next deal to discuss is number 10. The contract to play is 4 spades. Your cards and those of the dummy are:

NORTH
(Dummy)

♠ AQ75
♥ A54
♦ A85
♣ 953

SOUTH
(Declarer)

♠ K982
♥ KQT2
♦ QJ74
♣ 2

The Source, as West, opens the 7 of hearts against your 4 spade contract. You play small from dummy, East plays the 9, and you win with the ten. This deal looks fairly easy, as you might expect to lose only one club and perhaps one diamond. However, at trick 2 you receive an unpleasant surprise. On a trump lead to the queen of spades East shows out! The hand has just become much more difficult.

You must prepare to ruff at least one club in the South hand. Thus, at trick 2, you should lead the 3 of clubs from the dummy, on which East plays the ace. East returns the 3 of hearts, you play your deuce, West plays the 8, and you win with dummy's ace. Next, you ruff a club with the 8 of spades. Now it is time to try the diamond finesse by leading the queen from your hand. West covers with the king, and you win with dummy's ace. You follow this with another diamond to your jack.

At trick 8, hoping that West has at least one more heart, you should cash your king of hearts. Happily, West fol-

lows to the trick, as does East. Now, at trick 9, you cash the thirteenth heart, the queen, planning to discard your losing diamond in dummy if West does not ruff. West, though, ruffs with the 4 of spades, which you overruff with North's 5 of spades. Next, you lead the 9 of clubs from dummy, East plays the jack, you ruff with the spade 9, and West overruffs with the spade ten. West cashes the ten of diamonds, but you win the last two tricks with the king and ace of trumps, thus successfully making 4 spades.

Here's the complete deal and the play of the cards just described:

NORTH
(Dummy)

♠ AQ75
♥ A54
♦ A85
♣ 953

COMPUTER

WEST

♠ JT643
♥ J87
♦ KT2
♣ K4

COMPUTER
EAST

♠ —
♥ 963
♦ 963
♣ AQJT876

SOUTH
(Declarer)

♠ K982
♥ KQT2
♦ QJ74
♣ 2

	W	N	E	S
Trick 1	7H	4H	9H	TH
2	3S	QS	8C	2S
3	4C	3C	AC	2C
4	8H	AH	3H	2H
5	KC	5C	6C	8S
6	KD	AD	3D	QD
7	2D	5D	6D	JD
8	JH	5H	6H	KH
9	4S	5S	7C	QH
10	TS	9C	JC	9S
11	TD	8D	9D	4D
12	6S	7S	TC	KS
13	JS	AS	QC	7D

Contract: 4 spades

Tricks N-S: 10 Tricks E-W: 3

While on the subject of the activities available on The Source, I would like to mention the Postal Chess Club. Chess players wishing to participate are assigned in sections of 4 players in one of 5 classes of ability. Each player plays two games with each of his opponents, one game with the white pieces and one game with the black pieces.

Each player is assigned an initial

chess rating, which is kept updated as his games are won, lost or drawn. There is an entry fee to enter each section, with cash prizes awarded for first and second place in each section.

This method is an excellent way to play postal chess. Your moves are sent to your opponents via The Source without any mail delays! Furthermore, your cost to play is much less than when using postcards or letters to send your moves. For those of you with present accounts on The Source, if you wish more information on the Postal Chess Club, just type "DATA CHESSA" at your terminal.

Two new bridge products are expected to be available for this Christmas. One product is a bridge program for the new Texas Instruments 99/4 home computer, and the other is a bridge program for the TRS-80 home computer.

Texas Instruments is entering the home computer market with its new 99/4 home computer. One of the first cartridges or cassettes to be available for the computer is a bridge bidding product which I have been developing with Bobby Wolff of the Dallas Aces bridge team, the world's most successful bridge team over the past several years.

The program is a bidding program. As South, you select the bids with your cards, while the computer program provides the bids for your partner, North, and your East-West opponents. Each time it is your turn to bid you are given three chances to come up with the preferred bid. Should you not be able to select the preferred bid after three choices, the program will tell you what is the preferred bid, as well as providing you with an explanation of your proper bid, bids by your partner, or bids by East-West. Further, explanations of certain bidding conventions may be displayed on request. This product will provide an excellent way to sharpen up your bidding!

The bridge product for the TRS-80 home computer is one which I have been developing with Bob Hamman of the Dallas Aces. Bob Hamman and Bobby Wolff are, in the opinion of many, the strongest pair on the Dallas Aces bridge team.

The program is a playing program. Two principal options are available to

you. First, the computer can generate thousands of bridge deals, using a pseudo random routine which permits at any time the regeneration of a given deal. You, as South, play the North and South cards as the declarer at a contract the computer program suggests or one of your choice, while the computer defends with the East and West cards.

In the second option, for some selected deals you will have a chance to play these deals in an instructional mode. Each time it is your turn to play, you will be given three chances to come up with the best play. If you do not find the play in three choices, the program will inform you of the proper play. At this point you may elect to make the recommended play, or you may elect to leave the instructional mode and play the hand your way! A booklet accompanying the computer program cassette discusses each of the instructional deals.

Next month I'll present some example deals from both the Texas Instruments 99/4 bidding program and the TRS-80 playing program, along with some additional details on these two products. I think that you will find both programs most worthwhile additions to your bridge program library.

1980 CES Report

I recently attended the 1980 summer Consumer Electronics Show in Chicago. I was paying particular attention to the new products having to do with games of intelligence, such as bridge, chess and backgammon. Several manufacturers of these products are planning to send me production units for my review. After I have evaluated the performance of one of these units, I'll report on it in a future issue of *Personal Computing*. However, at this time I would like to give you an initial report on the new bridge products I saw at the CES.

Fidelity's "Voice" Bridge Challenger

Fidelity Electronics, Ltd., produced its first dedicated electronic bridge product in 1979. As I have mentioned in many of my articles in *Personal Computing*, its bidding was fair but its play very weak. Fidelity apparently has upgraded both the bidding and play of its product for the 1980 season. The new version of the Bridge Challenger is

expected to be available this fall.

Similar to its predecessor, the new Bridge Challenger will bid and play bridge against one or more human opponents. The hands the Challenger is to play for any bridge deal are entered into the computer in one of two ways. Actual playing cards may be passed over an optical scanner, or the cards may be entered via the keyboard. The suggested retail price is \$350. (A voice-feature option increases the price \$20.)

Tryom's Goren Bridgemaster

This product was originally going to be marketed in 1979, but it is now expected to be available this fall. The Bridgemaster is also a dedicated electronic bridge product which will bid and play 1, 2, 3 or 4 of the hands of a bridge deal, with human players bidding and playing the other hands.

Just as in the case of Fidelity's Bridge Challenger, the hands the Tryom Bridgemaster is to play are entered into the computer by optically scanning actual cards with coded markings or by typing in the cards via the keyboard.

However, the Bridgemaster has one very attractive feature lacking in the Bridge Challenger. The Bridgemaster is programmable with different cartridges; that is, as new bidding and/or playing cartridges are developed by Tryom, these may be used with the same master unit. This is a most worthwhile feature for the consumer.

The suggested retail price for the master unit together with the first bridge cartridge is \$399.95. Future tutorial cartridges are expected to retail for approximately \$24.95.

Activision's Video Bridge Game

Activision is a new company formed in October of 1979. For the near future Activision will focus on video game programs, but eventually the firm also will be developing and marketing home computer programs.

The company's first products are several game cartridges for the Atari programmable video game. The present members of Activision's program design team all were game designers at Atari during the last few years.

One of Activision's early cartridges, to be available near the end of the year, is a bridge cartridge. To a limited

degree, this bridge product both bids and plays bridge deals against you. You are South in all deals. The computer deals the cards, discarding any deal in which you do not have enough points for an opening bid or in which you and your partner, North, do not have more than half the high card points. Further, if you do not like your hand, you may ask the computer to deal another hand.

To initiate the bidding, you are assumed to be the dealer and have the first bid. The computer bids as your partner, North, while passing for East and West throughout the bidding.

When the bidding is completed, you are shown North's hand. You then play both the North and South hands, one of which is the declarer and the other the dummy, while the computer defends with the East-West cards. The defense does some "peeking" to assist its play.

Suggested retail price for the bridge cartridge is \$29.95. You must also have the basic Atari video game unit, which sells from \$140 to \$190.

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CIRCLE 25

Videotext: The Coming Revolution

Videotext: The Coming Revolution in Home/Office Information Retrieval, edited by Efreim Sigel; Knowledge Industry Publications, Inc., White Plains, NY 10604; 154 pp.; \$24.95 hardcover.

Developments in the computer industry constantly generate expansion in new directions. One current trend, computer networking, is described in *Videotext: The Coming Revolution in Home/Office Information Retrieval* edited by Efreim Sigel. Contributing experts Joseph Roizen, Colin McIntyre and Max Wilkinson detail the many aspects of the movement from its launching to advances made in various countries around the world and the future of the new technology.

This new phenomenon has met great enthusiasm in many applications. The authors explain how network systems can send news to homes and offices, communicate within a business organization, retrieve information from central data banks and solicit viewer reactions to events that affect everyday life. Experts discuss the evolution and implementation of various systems and elaborate on potential outcomes with respect to the societies these systems exist in.

Mr. Sigel has organized the book into chapters dealing with the videotext systems in Britain — Teletext, Viewdata and Prestel — and follows with chapters on videotext in the United States and other countries. His introduction to networking includes its development from the television industry, its effect on information transmission, its potential as an entertainment source and its capacity for expansion.

"As the decade of the 1980s approaches, new technologies and new economic forces are at work to turn that most familiar of appliances, the television screen, into a true information terminal. These technologies are coming from the electronics revolution in the two worlds of video and computers. The economic forces reflect the willingness of business (and some individuals) to pay high costs for information, provided the information is tailored to

their needs and can be delivered nearly instantaneously."

One chapter is devoted to the technology of Teletext and Viewdata, two British networking systems. The author, Joseph Roizen, outlines the differences between the information systems: "Teletext is considered a one-way system which piggybacks digital data on the normal television broadcast signal," while Viewdata "is an interactive (two-way) system in which the viewer can request information from a computer data bank, typically using a phone line to the computer." Roizen concedes that there are technological problems to be solved with videotext, but more importantly economic and psychological problems must be faced first. Will these systems be readily accepted by the population? Only time will tell.

Colin McIntyre elaborates on Mr. Roizen's outline by describing CEEFAX, the British Broadcasting Corporation's (BBC) own teletext system. Mr. McIntyre takes the reader step by step through the CEEFAX story; its beginnings, test broadcasts and start of full-scale operations. He also extensively details the content of CEEFAX and gives examples of what's available on the system. To close the section, the author relates the cost differences between CEEFAX and other videotext networks, the size of the audience, hours of use, waiting time, consumer acceptance, videotext abroad and its future.

Another section of the book deals with the Prestel System run by the British Post Office. "Prestel can already be employed to help people with tax problems, mortgage calculations or legal advice. In Britain, users will be able to punch in their credit card number to order a product delivered by mail. Alternatively, users could press one of the numbers on their keypad to indicate that they would like to receive further literature or catalogs from an advertiser," says the section's author, Max Wilkinson. He also describes Prestel's potential users, present services, costs, storage facilities, origin and technology.

Later chapters in the book deal with videotext in the United States and other countries. From preceding sections it is

evident that the British have taken the lead in the development of networking systems. According to Mr. Sigel, "the sheer size of the American market, however, and its pre-eminent position in the computer, telecommunications and information industries, made it inevitable that videotext would reach the U.S." Unlike Britain, the development of networks in this country has been left up to private corporations, not government actions. Consequently, the technology has progressed slowly with tests being conducted in isolated locations under the direction of local TV stations experimenting with European-style systems and cable television.

France and Canada have devoted considerable funds and attention to developing videotext through national research centers and communications centers. According to the section's author, Mr. Roizen, the French have taken a somewhat different approach than the British and developed ANTIOPE, their teletext version, and TITAN, the viewdata version. The Canadians, on the other hand, have made the largest governmental commitment and developed their system, Telidon, distinguished by "its ability to reproduce complicated graphics with a high degree of fidelity," according to Roizen.

Japan has several different systems under development, sponsored by both government agencies and private industry. Their television network, NHK, has experimented with a system that could provide services such as captioning for the deaf, weather forecasts, shopping and TV program guides. The postal and telecommunications agency (PTT) has set up a system resembling Britain's Prestel which provides educational material, community affairs information and other general data.

West Germany, Holland, Sweden, Denmark, Finland, Belgium and others have conducted tests, with the problem being the choice between existing systems in other countries. Work is being done to standardize and simplify a system to satisfy everyone's needs.

This book includes illustrations of each system's capabilities as well as detailed appendices of organizations

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Registration fee is only \$10 per day, and all registrants have free access to the hourly lectures.

LECTURE PROGRAM

A schedule of free lectures is available to all visitors. Lectures run about 50 minutes each, including, in most cases, some time for questions from the floor. Some topics are given twice, and, in some cases, topics of related interest are given on the same day for the visitor's convenience. (Program is subject to change without notice, but lectures will be posted daily in the show lobby.)

THURSDAY, OCTOBER 30

- Noon Introduction to Small Systems for Business, Stan Veit, Associated Computer Industries
- Noon Mailing Lists: Several Directions, Dr. Norman I. Agin, Mathtech, Inc.
- 1 p.m. Selecting a Small Computer for Business, David Benevy, Computer Mart of New Jersey

- 1 p.m. Evaluating and Improving Your Computer's Performance, Philip Grossman, Raytheon Co.
- 2 p.m. Law Office Systems Aspects of Word Processing, Bernard Sternin
- 2 p.m. Future Smart Machines: 2000 A.D. and Beyond, Dr. Earl Joseph, Sperry Univac
- 3 p.m. Computer Contracts—Facing the issues, Alan C. Verbit, Verbit and Company
- 3 p.m. Accounts Receivable/Accounts Payable/General Ledger
- 4 p.m. Using FORTRAN on a Microcomputer, Richard A. Zeitlin
- 4 p.m. Investment Analysis of Stocks and Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhoades, Inc.

FRIDAY, OCTOBER 31

- Noon Introduction to Small Systems for Business, Stan Veit, Associated Computer Industries
- Noon BASIC Programming, Michael Mulcahey, Worcester State College
- 1 p.m. Selecting a Small Computer for Business, David Benevy, Computer Mart of New Jersey
- 1 p.m. Videoprints: Full-Color, Low-Cost, Hard-Copy Computer Graphics, Warren Sullivan, Image Resource Corp.
- 2 p.m. Mailing Lists: Several Directions, Dr. Norman I. Agin, Mathtech, Inc.
- 2 p.m. Business Applications Software Development via Data Base Management, Dr. Andrew Whinston, Micro Data Base Systems
- 3 p.m. Application of PASCAL to Small Systems for Business, Panel, Stan Veit, Moderator, Associated Computer Systems
- 3 p.m. Investment Analysis of Stocks and Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhoades, Inc.
- 4 p.m. Advantages of Distributed Processing and Multi-Processing, John Steefel, Q1 Corp.
- 4 p.m. To be assigned.

SATURDAY, NOVEMBER 1

- Noon Educational Software: The Good, the Bad, the Ugly, Jo Ann Comito, S.U.N.Y. at Stony Brook

Noon Introduction to Personal Computing, RCA—Solid State

- 1 p.m. Computer-Assisted Mathematics Courses, Dr. Frank Scalzo, Queensborough Community College
- 2 p.m. Artificial Intelligence Update, Prof. Peter Kugel, Boston College
- 2 p.m. Compiling and Retrieving Personal Medical Data, Dr. Derek Enlander, St. Luke's Hospital
- 2 p.m. The Present State of CP/M Compatible Software, Tony Gold, Lifeboat Associates
- 3 p.m. High Volume Data Handling: An Introduction to File Processing, Prof. Peter Kugel, Boston College
- 3 p.m. Connecting the Computer to the Outside World, Prof. James Gips, Boston College
- 4 p.m. Educational Applications in the Home, David Ahl, "Creative Computing Magazine"
- 4 p.m. Household Applications—Some New, Dr. Dennis J. McGuire

SPECIAL SESSION: EXECUTIVE EDUCATION CONFERENCE FOR BUSY PEOPLE

This year, NSCS will present a special five-hour conference formulated as an intensive fast education for administrators and executives. The aim is to show the conferee how to cope with computers in business. No prior knowledge of computers is needed. The session will proceed on a step-by-step basis, covering computers, computer jargon, software systems, and peripherals. It will indicate how to assess computer requirements, how to talk to vendors, and how to make a system work efficiently, after you've bought it wisely.

An executive education session will be given daily for four days, Oct. 29 through Nov. 1, in the New York Coliseum. Each session is limited in attendance, and reservation must be made. Registration is on a first-come, first-served basis. Fee is \$200, and includes three-day admission to the National Small Computer Show, coffee break, and workbook materials. Please write or call the show office for session outline and registration form. (Do not use registration form in this ad for special session.)

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involved in videotext and Prestel information providers.

Videotext provides an extensive state-of-the-art discussion on computer net-

works by giving you an inside look at the technology's past, present and future. It may not be too long before you can read this book in the comfort of

your home on your own television screen.

—Reviewed by Elli Holman

What Can Be Automated?

What Can Be Automated? edited by Bruce W. Arden (The Computer Science and Engineering Research Study); The MIT Press; 28 Carleton St., Cambridge, MA 02142; 934 pp.; \$29.95 hardback.

What Can Be Automated? is a comprehensive volume on computer science and engineering edited by the chairman of the Electrical Engineering and Computer Science department at Princeton University, Bruce W. Arden. The book consists of over 900 pages covering practically every aspect of the field of computer technology. Its special purpose is to define current research areas with some limited projections of future developments. However, I discern more than establishing an operational definition; there is a conscious effort by the 80 research contributors (all well-known experts in their specialties) to make the reading understandable and even tutorial.

The real strength of this book lies in its text, written at a level suitable for the educated layman (who possesses some technical background). There are certainly a few sections that might require some technical background in higher calculus, but they can be considered a small fraction of the text. Most of the pages are very readable, informal, clear and interesting.

Although we can't possibly cover all the book's topics in a short review such as this, I want to briefly outline some of the major categories of subject matter. The preface deals with the overall philosophy and objectives of COSERS, The Computer Science and Engineering Research Study, responsible for the book. Initial planning began in 1974 and the study got underway in 1975. The National Science Foundation supported a major part of the effort and revisions were made up until 1979. "At the outset, the decision was made to heavily edit the submitted manuscripts

in an effort to remove jargon . . . that would tend to restrict readers to those with some familiarity with the subjects . . . the goal was to produce prose that would be readily accessible to a layman having general knowledge of science and technology," the preface states.

Because the written text meets the above criteria, I have no hesitation in recommending this book to readers who have some background in science and technology. The first two chapters deal with an overview of the field of computer science, including some history, definitions and statistics on employment, education, funding and so forth. The subject of numerical computation is defined and studied in depth in Chapter 3. Perhaps this might be the most difficult chapter for laymen but the reading seems to get easier as you proceed. Chapter 4 deals with the theory of computation, data structures and search algorithms, language and automata theory. It closes with discussion on patterns of training, support of research and recommendations.

Chapter 5, titled "Hardware Systems," covers just about everything from calculators and microcomputers through large scale systems. Anyone with some background in computer technology should enjoy reading this chapter, especially those involved in the beginnings of this relatively new field of computer science.

My favorite topic, artificial intelligence, is covered in Chapter 6. The chapter opens with real-life examples of operational artificial intelligent systems. "A geologist dials a government data base on lunar rocks . . .," and the dialogue between man and machine is displayed in the text. In the second example "a business executive specifies that he wishes to interact with GUS, a computerized travel consultant, on his personal terminal." The dialogue between the executive and GUS (an artificial intelligent system) is quite

an interesting example of the usefulness of natural spoken language when communicating with a computer. I am all for "natural" English; however, only the principles of artificial intelligence (as explained later in the chapter) can be utilized for driving such a complex program as natural language dialogue. Over 150 pages are dedicated to this field in the book. Chapter 7, "Special Topics," is directly related to AI with sections on computational linguistics, pattern recognition and image processing.

Chapter 8 deals with programming languages — history, very high level languages, special purpose languages, language description technology, implementation techniques, global program analysis and many more topics.

If you have never read a general discussion about the nature of operating systems in computers, Chapter 9 is your chance to get more information in one place than you even need to know if your main area of interest is applications. In Chapter 10, covering database management systems, some sections get technical; however, it is interesting reading on this important application.

Chapter 11 deals with software methodology — findings, practices and a small example of program development are illustrated. The last chapter, titled "Applications," studies weather forecasts, medicine, air traffic control and machine perception.

The only weakness worth mentioning is that while the price is right for a hard cover edition (the book is bound well), I'd like to see it out in paperback at a lower price so the philosophy of the project could be carried further to permit greater distribution at lower cost. I do recommend that libraries acquire this volume, as well as readers who want up-to-date information. Thirty dollars may seem like a lot, but the book is worth it!

—Reviewed by William R. Parks

WHAT'S COMING UP

SOFTWARE

Program Extends Z-80 Development ROM Pac for Sorcerer

Quality Software announced availability of DPX (Development Pac Extension), a co-resident machine language system that loads on top of the Exidy Z-80 Development PAC and extends this ROM-based assembler-editor with an additional eighteen commands.

DPX adds editor commands for upward as well as downward pointer movement, string search, and global or queried string change (with "wild card" characters).

Additional file commands enable the user to extract blocks of Z-80 source text onto dual cassette named files, at 1200 baud, and to merge named routines from cassette files into selected places in existing text. This permits building and using a fully indexed tape library of commonly used Z-80 routines.

Other extensions include a built-in RS232 printer driver, the ability to halt and resume assembler listings, and single command jumps among the DDT80, Editor or Monitor subsystems. DPX also provides the capability of recovering lost or damaged files.

By using DPX in conjunction with the Exidy Development PAC, the programmer has, in a compact cassette based system, all of the needed and convenient features for serious Z-80 program development.

DPX runs on all Sorcerer configurations from 8K to 48K and does not interfere with normal ROM-based commands. It retails for \$29.95 and includes a sixteen page user manual. For more information contact Quality Software, 6660 Reseda Blvd., Suite 103, Reseda, CA 91335; (213) 344-6599. *Circle No. 109*

Property Management System

A-T Enterprises announced an income property management software package compatible with the Radio Shack TRS-80 Model II. The Property Management System (PMS) was designed to meet the Institute of Real Estate Management (IREM) recommended computer system capabilities.

PMS is suitable for all types of income properties including apartments, mobile home parks, office buildings, warehouses and so forth. A full general ledger system, it keeps track of all income and expenses providing fully formatted financial statements, management reports and exception reports upon request.

The system is completely interactive and comes with complete documentation. Major features of the system include: full general ledger, trial balance, balance sheet, operating statement, budgeting, rent roll, tenants activity report, delinquency report, lease expiration report, vacant units report, lost rent report, vendor report, check writer, labels, billing and letter writing, full audit trail, real estate support programs, cash flow analysis, depreciation schedules and loan amortizations.

PMS will operate on the TRS-80 Model II with 48K of RAM, two 8" diskette drives and a printer. It is written in CBasic, runs under CP/M and is also compatible with most Z-80 and 8080 systems.

Cost of the PMS software including one year maintenance is \$650. A demonstration diskette with operations manual is available for \$35. For additional information contact A-T Enterprises, 221 North Lois, La Habra, CA 90631; (213) 947-2762. *Circle No. 112*

Basic Programs for Heath Computers

J.E. Brancheau Engineering Company offers Heath cassette system owners all 76 programs presented in the book *Some Common Basic Programs* by Lon Poole and Mary Borchers of Osborne and Associates. This collection of programs includes business, finance, math, statistics, plotting and various other general interest applications.

Programs involving interest rate calculations have been modified to maintain higher accuracy than can be obtained by simple application of the standard financial equations. All programs will run with any version of Heath Basic and only four require Extended Basic.

The price is \$15 for the cassette tape. For more information contact J.E. Brancheau Engineering Co., Box 67, Trenton, MI 48183. *Circle No. 115*

Automatic Program Improvement

Data Associates has announced release of Pack8, designed to permit the convenient improvement of Basic programs. It automatically removes remarks or spaces or both from programs as specified by the user. The resulting program loads faster, runs faster and takes less memory space, the company said. Program size reduction can be as large as 40 percent.

Pack8 is written for use on the TRS-80 Model I, for both 32K and 48K memory size. It uses only one disk drive. Since the program operates on blocks of strings, the size of the program to be compacted is limited only by the space available on the disk. All the lines in the program can be compacted, or you can specify a block of numbers, inclusive, to be packed. At the end of the packing process, a summary is presented of the number of bytes and lines in the original program and in the packed version.

Use of this packing program is particularly valuable to those who write programs in the structured, modular program form, with good use of remarks and spaces, the company said. A program can be written in the longer, expanded, structured form and easily converted into the packed form for actual use. This packed form also adds a certain degree of protection against software piracy. The line numbers are kept the same. Thus the version in the unpacked form provides documentation and is a convenient source for developing new and related programs.

Pack8 is provided on cassette along with operating instructions and is available for \$19.95. For more information contact Data Associates, Box 882, Framingham, MA 01701. *Circle No. 118*

Programming Utilities for TRS-80

PROgrammer by Rational Software provides professional-quality programming tools to users of TRS-80 Level II Basic.

After the small machine-language routine is read once, all five functions — renumber all or any part of the program; move blocks of lines within the program; append additional routines from tape; pack the program to reduce size and speed execution; and delete blocks of lines — are continuously available.

A single keystroke directs keyboard input to PROgrammer, which interprets the command line and executes the specified operation. After execution, control is automatically returned to Level II Basic. PROgrammer also includes a keyboard debounce routine.

PROgrammer is available on cassette, with complete instructions, for \$25. For more information contact Rational Software, 963 East California Blvd., Pasadena, CA 91106. *Circle No. 121*

PRINT USING for the Apple

The Optimized Systems Software Group of Shepardson Microsystems has announced Business Basic with PRINT USING for the Apple II.

Business Basic contains all of the features of OSS Basic plus several extensions including PRINT USING. The PRINT USING statement provides the ability to format a number, to left or right justify a string and to print any format character using an escape feature. OSS Business Basic also has versatile record I/O capabilities. Entire blocks of memory can be written and read, or numeric values and strings can be output and retrieved in fixed length records.

Business Basic runs under the OSS operating system CP/A on a 48K system with a disk. Price is \$84.95. Business Basic combined with the compatible OSS Assembler/Editor/Debug package is \$124.95. For more information contact Optimized Systems Software, Shepardson Microsystems, Inc., 20395 Pacifica Dr., Ste. #108, Cupertino, CA 95014; (408) 257-9900. *Circle No. 124*

Machine Language Save/Load Utility

Percom Data Company announced a machine language save/load utility that operates under OS-80, Percom's disk operating system for the TRS-80 computer.

The utility may be used to save, load, copy and otherwise manipulate machine language programs through the facilities of OS-80.

OS-80 is a 7-Kbyte, user-extendable disk operating system (DOS) that replaces TRSDOS. It was originally released under the name MicroDOS in 1979. OS-80 works in conjunction with Level II Basic to provide you with a Basic language DOS.

With the new utility, machine language programs are saved by loading the machine language program, the OS-80 program and the save/load utility into memory, and then responding to the utility-generated prompts for execution.

Programs that have been saved are loaded with the Level II Basic Load command just as though the program was written in Basic.

The OS-80 Machine Language Save Utility is provided on a minidiskette that also includes a patch to allow the Radio Shack Basic language Renumber Utility to run under OS-80. The minidiskette along with user instructions costs \$14.95.

OS-80, which is supplied on a minidiskette along with a comprehensive user instruction manual, costs \$29.95.

Orders may be placed by calling Percom's toll-free order number, 1-800-527-1592, and may be paid by cashier's check, certified check, money order or COD, or charged to a VISA or Master Charge account. For more information contact Percom Data Co., Inc., 211 N. Kirby, Garland, TX 75042. (214) 272-3421. *Circle No. 127*

Reading Skills Instruction

Program Design announced four new titles to help students with vocabulary/reading skills. The new titles are from the Brain Box software development group and are available for Apple on disk or cassette and for Pet on cassette.

Word Skills 2 and Word Skills 3 cover common prefixes and suffixes with clever graphics and fun reactions from the computer. They are in the Word Skills series.

Word Meanings teaches synonyms, homonyms, antonyms and troublesome words, again with exciting, motivating graphics. These 3 titles are for kids 10 and up.

For high school, especially for remedial work, there is Nouns, covering common and proper nouns.

All titles are \$14.95 on cassette, \$19.95 on Apple disk and are available through Computerlands and other local computer stores. For more information contact Program Design, 11 Idar Ct., Greenwich, CT 06830; (203) 661-8799.

Circle No. 130

Text Editing for TRS-80

MPS Software announced a new release of Wordscribe, a full-feature word processing system for the TRS-80 Model I and II. Wordscribe 1.2 includes the full editing features of release 1.1 and adds some new formatting capabilities.

Wordscribe utilizes a full-screen editor that contains many features of large system text editors, yet the editor remains simple and straightforward to use. Command syntax utilizes easy to remember one or two letter abbreviations for each command.

New features include document chaining allowing you to load more than one document at a time for merging documents and inserting standard blocks of text. Also included are new formatting commands to change line lengths, force page breaks and change line spacing with a body of text.

Minimum system configuration to use Wordscribe is a Model I TRS-80 48K with one disk.

Wordscribe is priced at \$79.95 for Model I, \$129.95 for Model II. For more information contact MPS Software, 11223 E. 45 St. So., No. 314, Tulsa, OK 74145.

Circle No. 133

Programming Aids for Apple

Dakin5 Corporation has marketed a 12 program utility package. This set of programming aids contains Apple's new DOS 3.3, which provides the user with 23% more diskette storage.

Included utilities of this 12-in-1 set are: copies any file or program to another diskette, only the file or program name is needed; removes comment statements and compresses code in Applesoft programs; provides a powerful data entry routine that handles both numeric and string data. Some options include entering commas, decimal points and leading zeros with right-justified numerics, a maximum field length can be specified to prevent overflow in both numeric and alphanumeric fields; allows you to display any sector of a given file and to update any data within that sector. Another option enables you to specify the sector to be updated such as directory sectors and sectors occupied by DOS; with a simple word processor, lets the user create and modify text and EXEC files; displays or prints a listing of all referenced lines by GOTO, THEN, GOSUB, and LIST statements in an Applesoft Basic program. GOSUB only option available. Another program displays and prints variable names with line numbers; a diskette copy program verifies the source diskette before initializing. Then it does the copy, verifying that the data on the destination diskette is the same as that of the source diskette. The program will also initialize without DOS, or do a copy without DOS.

The package includes complete documentation and a program diskette in a padded, print vinyl 3-hole notebook. It runs on an Apple II or Apple II Plus with 48K, two disk II's and printer. Language is Assembler/Applesoft II and it is priced at \$70. Programming Aids 3.3 is available from local Apple dealers. For more information contact Dakin5 Corp., P.O. Box 21187, Denver, CO 80221. *Circle No. 136*

Interactive Accounting Software

Compumax Inc. announced an addition to its collection of interactive accounting software — Order Entry.

The sixth in their set of integrated business software, Order Entry will handle the documentation and control of both purchasing and sales. Further, the relevant information will ripple through the other Compumax programs — Accounts Payable, Accounts Receivable, Inventory Control and General Ledger — updating these modules to reflect purchase and sales activity.

Order entry capabilities include: generation and printing of both purchase orders and sales orders in mailable format, computation of tax on taxable purchase orders and sales orders, registration of deliveries against outstanding purchase orders and of shipments against outstanding sales orders and complete Purchase Order and Sales Order history reports.

Order Entry is available in the following versions: Micropolis 1053/II (48K), Apple II 32K, Pet (DOS 2.0) 32K and Microsoft under CP/M.

Order Entry may be used stand alone or as a part of the interactive set. To fully benefit from this powerful system,

however, the company recommends that Order Entry be used with the other Compumax programs. In this way the accounting process becomes an integrated procedure.

Price is \$350. For further information contact Compumax, Inc., P.O. Box 1139, Palo Alto, CA 94301; (415) 321-2881. *Circle No. 145*

Cobol Available for TRS-80 Model II

The new Cobol Development System software package from Radio Shack lets you write and use programs in Cobol (COMMON Business Oriented Language) on your TRS-80 Model II microcomputer system.

Radio Shack Cobol makes the TRS-80 Model II compatible with a vast library of existing Cobol programs, including some written for mainframe computers. According to Radio Shack, more programs with business and accounting applications have been written for Cobol than for any other computer language.

The system is considered to be the only Cobol for a microcomputer which offers multi-key ISAM (Index Sequential Access Method) files, the company said.

Features of Cobol include: a one-pass compiler which generates an object code which can then be executed directly by the run-time package, full screen formatting, full ANSI Level 2 I/O, program linkage and segmentation.

Cobol Development System, with reference manual, user's guide, sample program and disk, is priced at \$299. The complete TRS-80 Model II System with Cobol software is available for \$4198 from participating Radio Shack stores, dealers and Computer Centers nationwide. For more information contact Radio Shack, 1300 One Tandy Center, Fort Worth, TX 76102; (817) 390-3272. *Circle No. 148*

Heath Offers Source Codes

Heath Company now offers its microcomputer customers source codes for the company's internally developed systems software and firmware.

Source codes to be released include those for Heath's cassette Assembler, Debugger, Editor and Basic; and the source code for HDOS — Heath's disk operating system. Also being offered are the firmware for the H-17 and H-89 disk controllers, as well as the firmware for the H-19 video terminal.

HDOS is said to be a relatively sophisticated disk operating system using fully dynamic allocation and deallocation, as well as multiple relocatable non-resident overlays and devices drivers. According to Heath, the capabilities of HDOS are quite similar to those of CP/M, although HDOS is incompatible with CP/M and different internally.

A price of \$25 per listing has been established, except for HDOS, which will be \$195. The H-19 code will also include source on a Heath HDOS diskette and the character generator ROM code.

For further information contact Heath Company, Dept. 350-390, Benton Harbor, MI 49022; (616) 982-3210. *Circle No. 151*

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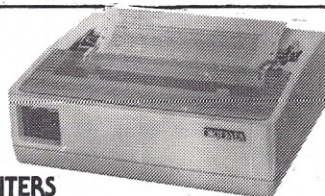
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WHAT'S COMING UP

Report Writing Utility

Ripley Computers announced the first in a line of micro-processor system software products that combine matched software and hardware to enhance Smoke Signal Broadcasting Systems running under the DOS68 version 5.1 Operating System.

Micro Writer is a report writing utility which enables you to catalog report formats and specifications. Report production involves calling the report run time, specifying the report name from the file catalog and receiving the desired report on the printer. The entire system is written in 6800 assembler to obtain the best performance for production reporting.

Micro Writer uses a Cobol orientated language syntax to describe file formats, control structures and detail portions of the desired report. The user language statements are processed by Micro Writer's translator to produce a source assembler file which is then processed by your standard assembler producing an object report file. This file represents the data file descriptions, headings and footings and specifications for control and accumulation elements. Execution of the run time binds this object file as a run time extension and then produces the desired report.

File structures supported are both variable length (e.g., Basic), and fixed length/fixed field (e.g., Fortran, Cobol, BAL) types. The file access by Micro Writer is determined through a user defined file assignment and data record description for processing the file contents.

Editing is provided for numeric data items and includes fixed dollar, floating dollar, decimal point insertion, zero suppression and editing around any mask character supplied. During editing operations when a mask specifies a decimal point the data item is aligned and adjusted to match the mask prior to editing the data item.

Accumulations are provided with any number of working storage data items defined and used in appropriate SUM clauses. All accumulations are evaluated and aligned before the accumulation is performed to insure proper decimal point usage in producing results.

Page headings and footings are provided for each page, and page definitions are provided for both physical and logical definitions and layouts. Control structures for headings and footings enable automatic testing and processing to produce the desired output results.

Documentation includes a user manual covering five sections for a total of approximately 60 pages. Within this manual, sections are provided for those new to report writing and those experienced. A full example with report specifications, the data file used and an explanation of each step is provided.

Micro Writer stresses ease of use by providing simple structures which produce satisfactory results when followed. All syntax error reporting is forced through the assembly phase which combines all user errors into one listing. Run time errors are few and deal mainly with illogical conditions which are indicated on the printer during report execution.

Micro Writer retails at \$249 for the complete package including translator, run time and documentation. For more information contact Ripley Computers, 126 North Main St., Souderton, PA 18964; (215) 723-1509. **Circle No. 154**

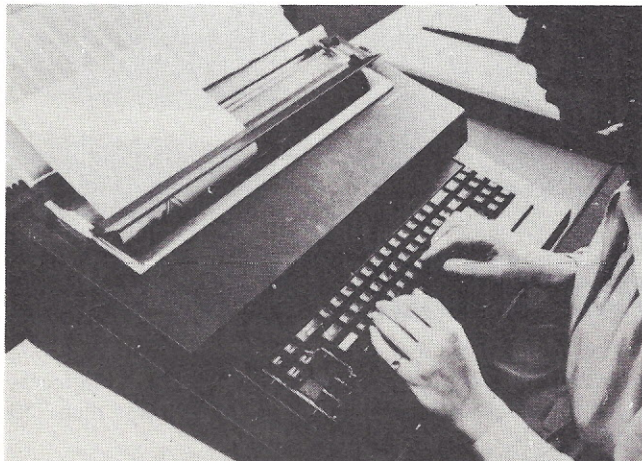
PERIPHERALS

Letter-Quality Computer Printer

Howard Industries, Inc. announced the Typrinter 221 a letter-quality daisy wheel printer with five built-in micro-processors, providing complete text formatting.

Based on the top-of-the-line, award-winning Olivetti model ET-221 electronic typewriter, the Typrinter 221 also functions as a sophisticated electronic typewriter, bringing new economies to the office or personal computer user.

The Typrinter 221 is compatible with all micro, mini and mainframe computers. It utilizes a parallel Centronics interface, with RS-232C and IEEE-488 interfaces also available. The Typrinter 221 can respond to formatting commands imbedded in the text eliminating the need for additional text formatting software. It automatically provides many text formatting functions, including right justification, with or without proportional spacing; tabbing; bold and/or underlined characters; title centering; and decimal point location.

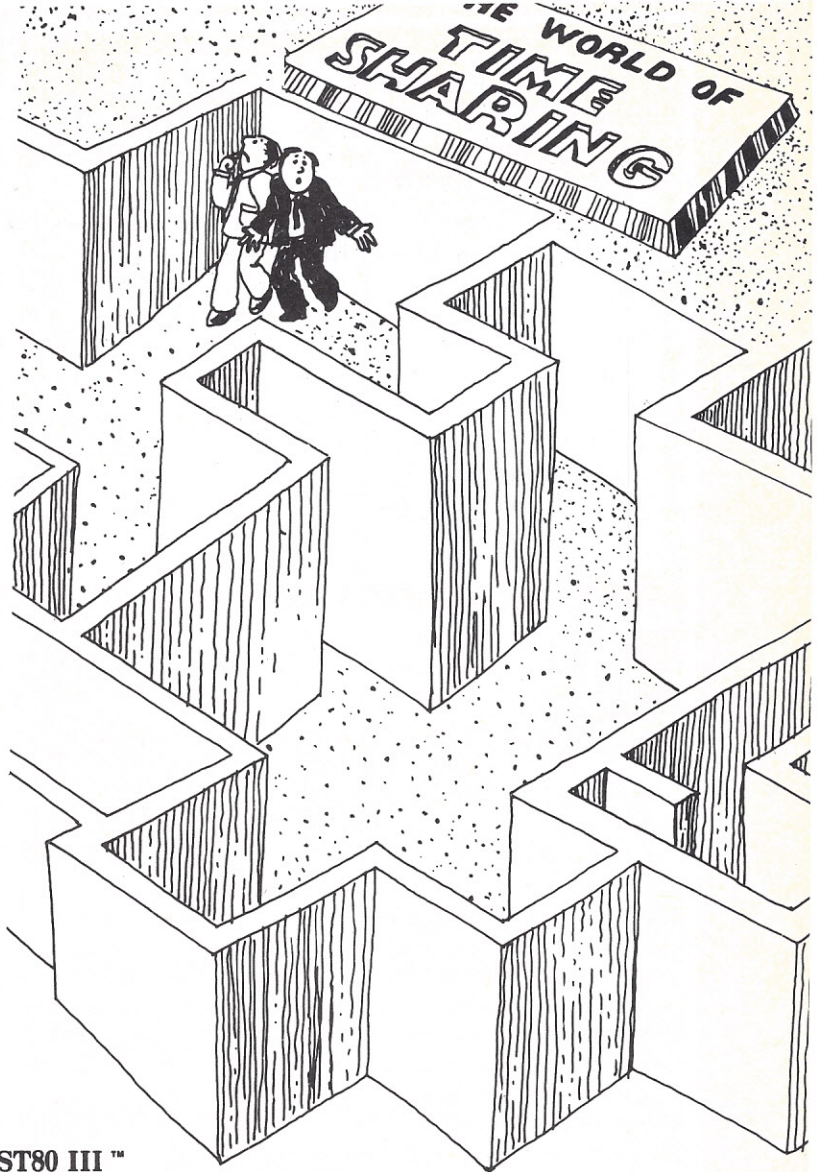


You can select from three different sizes of type (Elite, Pica or Mikron) as well as proportional spacing. Each standard daisy wheel has all the characters necessary to print in Spanish, Italian, French and German as well as English, with over 20 fonts currently available. Correctable carbon ribbons in five colors as well as reusable nylon are available.

One of the most novel features of the Typrinter 221 is its ability to print in reverse, that is, white characters on a black background for highlighting critical information. It can also function as an advanced electronic typewriter featuring an alphanumeric display showing the current line, column position and lines remaining to the end of the page.

The Typrinter 221 is priced at \$2750 and is available at computer dealers worldwide or directly from the factory. First deliveries are scheduled for September, 1980. The Typrinter 221 comes with a 90 day warranty. Maintenance is available at Olivetti service centers throughout the world.

A brochure describing the Typrinter 221 is available. For more information contact Howard Industries, Inc., 2031 E. Cerritos Ave., Bldg. 7K, Anaheim, CA 92806; (714) 778-3443. Circle No. 157



ST80 III™

The Ultimate Communications Utility

The *Smart Terminal Communication Package* from SBSG, Inc., can turn your TRS-80* Model I or Model II Microcomputer into a very intelligent distribution processor. Easy to use commands and a built-in HELP function insure successful operation even by the most inexperienced personnel. Full user control of all communication options insure that whatever your communication requirements, ST80 III™ can provide for them. We'll get you there.

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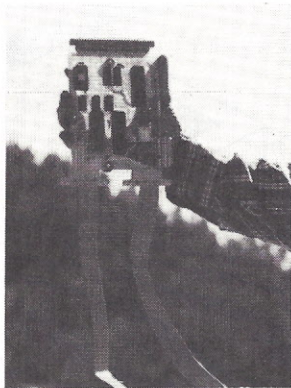
SBSG, Inc., provides full user support and markets three other ST80 products. Any computer with communication capability can be accessed by ST80 III™ via your TRS-80*

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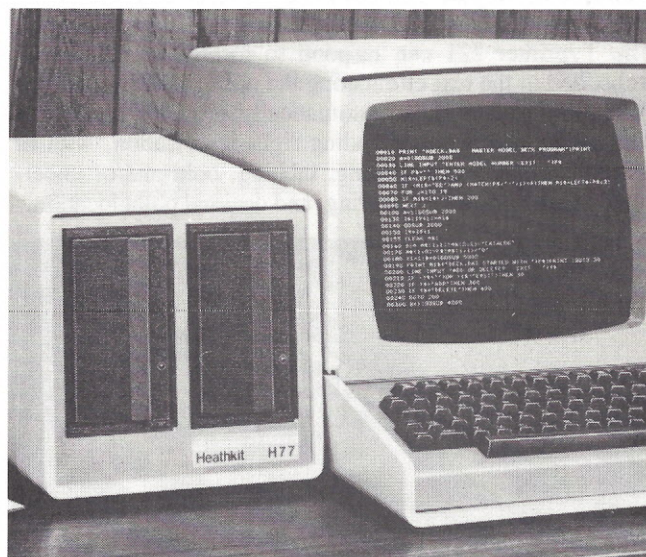
WHAT'S COMING UP

Floppy Disk Accessory for All-In-One Computer

Heath Company's new floppy disk accessory for its Heathkit H89 All-In-One Computer provides all the storage and programming capacity needed for most computer applications, Heath said.

When the H-77 Floppy Disk System is used with the All-In-One Computer, room is provided for up to three floppy disk drives. Operating system and program disks can be run at the same time for fast and efficient access to programs and data.

Designed especially for the All-In-One Computer, the H-77 is based on the Heathkit H-17 Floppy Disk System. The H-77 uses standard 5.2-inch, hard sectored 40-track diskettes and each diskette is capable of storing 100K bytes of data.



The Siemens 82 disk drive system is used in the H-77, providing reliable high-speed access to data. Heath engineers say the typical random sector access time is less than 250 milliseconds.

The H-77 Floppy Disk System, priced at \$595 in easy-to-assemble kit form, includes one disk drive. A diskette storage accessory, which fits into the space reserved for the second drive, is also included. The H-17-1 Disk Drive, priced at \$325, is available to provide two-drive capability for the H-77, giving the H89 a total of three drives including the drive built into the computer itself.

The factory assembled and tested WH-87 Floppy Disk System, priced at \$1195, includes two drives. The H-88-6 Adaptor kit, priced at \$50, is required to install the WH-87.

For more information obtain a free catalog from a local Heathkit store or from Heath Company, Dept. 350-280, Benton Harbor, MI 49022. In Canada, write Heath Company, 1480 Dundas Highway East, Mississauga, Ontario L4X 2R7. Circle No. 142

TRS-80 Direct Connect Modem

The Micro Connection is an integrated RS-232 adapter and direct connect telephone interface (modem) designed to be used with any model TRS-80 from Level I, 4K to Level II,

48K and connect to the computer data bus. The device eliminates the need for the Radio Shack expansion box, RS-232 adapter and acoustical telephone interface in telecommunications applications.

Direct connection to the telephone line provides silent operation, an additional 20 db of sensitivity and elimination of errors due to room acoustical noise. Its RS-232 circuitry provides an I/O port for driving any serial printer capable of 300 baud operation, even while the modem is in use.

Several features have been incorporated in The Micro Connection to make it more than a modem, the company said. For example, provision has been made to permit communications over amateur radio and other two-way radio systems. A Data-Patch feature (similar to a voice "phone-patch") interfaces telephone line data, from remote locations, to the radio system for transmission and reception via the modem.

Advanced software includes both dumb and smart terminal programs for cassette and disk systems, plus an intelligent program for portfolio management (The Dow Jones Connection). Message programs for Mailgram and overseas telex services are presently being developed.



The Micro Connection can adapt any TRS-80 for telecommunications with The Source, MicroNet, public bulletin boards, in fact, virtually any computer system operating at 300 baud. It is ideally suited for systems applications where low cost terminals, with computing power, are required. The combined cost of the TRS-80, Micro Connection and software is less than \$750.

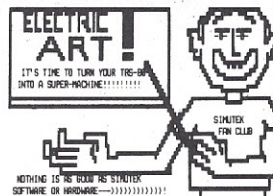
The Micro Connection is priced at \$249 complete with bus connector UL approved power source and a terminal program. For additional information, contact The MicroPeripheral Corp., P.O. Box 529, Mercer Is., WA 98040; (206) 454-3303. Circle No. 101

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CIRCLE 30

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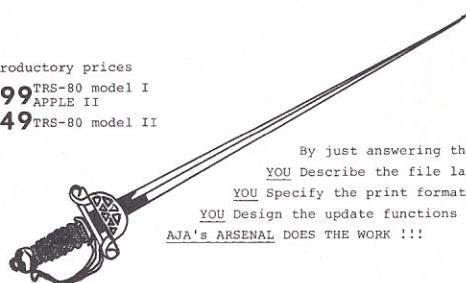
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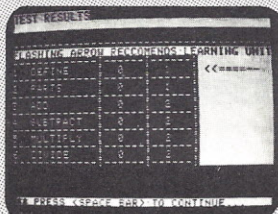
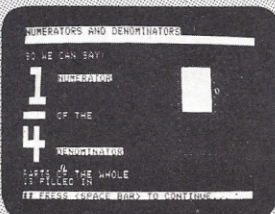
EPEE - Single or dual file report and update utility.

*Program descriptions for the APPLE II ARSENAL differ slightly.

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CIRCLE 33

Home Controller Interface for TRS-80

Small System Software's Whistler, a software controlled ultrasonic interface, allows complete control of the BSR Home Control System from the TRS-80 microcomputer. The BSR unit, marketed by Sears, Radio Shack and other firms, must have the ultrasonic remote controller option installed (all Sears units include this option).

Whistler is packaged in the same small (1" x 2" x 3") box as the company's TRS232 printer interface. Whistler is self-contained, requires no physical attachment to the BSR unit, and requires only a single connection to the tape recorder output plug from the TRS-80. The unit is powered by a single 9-volt transistor battery. Battery drain during standby operation is less than 1 micro-amp and a fresh battery should last longer than 1 year.

The interface unit contains an ultrasonic oscillator and piezoelectric transducer, and is controlled with signals from the tape recorder output port. Cassette software (also compatible with disk systems) included with Whistler contains the necessary coding patterns for full control of all BSR functions, including bright and dim lamp controls. Both demonstration and test routines for exercising Whistler are included. Controller subroutines are written to allow interaction with simple GOSUB calls, making it easy for the user to write his own programs for controlling household lighting and appliances, computer peripherals, photographic darkrooms, or nearly any other 110 volt device, the company said.

Introductory price is \$34.95, including software and full documentation. Ask your local dealer or order directly from Small System Software, P.O. Box 366, Newbury Park, CA 91320.

Circle No. 137

Flexible Disk Drive for HP-85

A flexible disk drive family providing up to 1.08 Mbytes of on-line capacity for the HP-85 personal professional computer was introduced by Hewlett-Packard.

The low-cost (less than 0.5 cents per byte) HP 82900 Series drives read double-sided, double-density, 5-1/4 inch disks, and can be configured to provide 270 Kbytes to 1.08 Mbytes of storage.

Disk memory increases on-line storage beyond the 217 Kbytes available on the HP-85's data cartridge and simplifies on-line data storage operations found, for example, in scientific, engineering and business data-base and program applications.

The interface between the HP-85 and the disk drives is the HP-85 Mass Storage Read Only Memory (ROM), which is designed to make the mass storage system powerful and easy to use, the company said.

With the Mass Storage ROM plugged into the HP-85, the disk operating system is ready to go as soon as power is turned on. The disk memory is totally integrated into the HP-85 system, and no bootstrapping procedure is necessary.

The ROM makes a powerful set of instructions available that increases the HP-85's mass storage capabilities. Included are 30 additional Basic commands that allow you to

take advantage of those capabilities without learning a new language. Many of these commands are programmable so automatic data base management can be performed by programs.

Other features of the ROM include: a TRANSLATE command which automatically upgrades previously written tape-based programs for use on the disk drives; the ability to



quickly and easily store and retrieve the graphics display on the CRT, forms and labeled charts; automatic default to the disk drive, so it is the subject of mass storage commands at power-on; and volume labeling, which lets you refer to disks by name and write programs independent of drive addresses.

The HP 82900 disk drives feature double-sided, double-density recording for more storage capacity per disk leading to low-cost mass storage: less than 0.5 cents per byte.

The HP 82900 Series Drives can be configured in a variety of ways, giving you price/performance flexibility. Expanding the mass storage system is easy and inexpensive with "master-slave" configurations. The HP 82900M is a dual master drive with 540 Kbytes of on-line storage. An HP 82901S dual add-on drive doubles the total storage, making available 1.08 Mbytes. Users who need less storage but want the performance and convenience of disk storage can use the HP 82902M single master drive (270 Kbytes) and can get 270 Kbytes more with an HP 82902S single add-on drive, for a total of 540 Kbytes.

The 82900 Series disk drives communicate with the HP-85 via an HP-IB (Hewlett-Packard Interface Bus, HP's implementation of IEEE Standard 488-1978) interconnect cable and an HP-IB interface module that plugs into the HP-85.

The new disk memory system is the latest addition to the HP-85 system, which now includes a personal computer with an HP Basic language, interactive graphics CRT and an integrated thermal printer, plus these peripherals: flexible disk memory system; low-cost 180 cps printer; and a professional-quality graphics plotter.

Prices are: HP 82901M dual master drive \$2500; HP 82901S dual add-on drive \$2200; HP 82902M single master drive \$1500; HP 82902S single add-on drive \$1300; and HP-85 Mass Storage ROM \$145.

For more information contact Hewlett-Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304; (415) 857-1501.

Circle No. 139

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Features:

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Catalog #:

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Micro-BEEP is a simple sound device that operates off your aux. plug from your cassette cable. Now you can have inexpensive, easy to use, sound for an excellent price!

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OUT255,4 = ON OUT255,0 = OFF

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Catalog #:

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Micro-BEEP is being used by TRS-80 Owners all over the world!

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\$29.95

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Phone orders welcome 24 hours! (602) 886-5880. Simutek offers a number of other fine products especially for TRS-80's! Send for "FREE" catalog. TRS-80 is a TM of Radio Shack, A Tandy Corp. Arizona residents add 4% sales tax

CIRCLE 34

DISK DRIVE WOES? PRINTER INTERACTION? MEMORY LOSS? ERRATIC OPERATION? DON'T BLAME THE SOFTWARE!



ISO-1



ISO-2

Power Line Spikes, Surges & Hash could be the culprit!

Floppies, printers, memory & processor often interact!

Our unique ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.

***ISOLATOR (ISO-1A) 3 filter isolated 3-prong sockets; integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket** \$56.95

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***SUPER ISOLATOR (ISO-3), similar to ISO-1A except double filtering & Suppression** \$85.95

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***CIRCUIT BREAKER, any model (add-CB) Add \$ 7.00**

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CIRCLE 35

WANTED:

BUSINESS PROGRAMS

Personal Computing readers want your business applications programs. Chances are, the software you've developed to solve your business problems will also help someone else faced with a similar problem.

Consider how your business benefits from your microcomputer — not only in the obvious areas of inventory, accounting and payroll, but in all departments and levels right up to the president's desk. Financial and marketing analysis, time management, planning, materials handling, product design and cost accounting are areas ripe for creative programming. Readers want help with all of these problems.

So why not share your solutions with our readers? Send us an article describing the problem you faced and how you used your microcomputer to solve it. Be sure to include a program description, program listing and sample run.

Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications, other businesses or other situations.

All submissions should be original, typed (not all CAPS), double-spaced and neat. Include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material. Also, please use a fresh ribbon on your printer for program listings and sample runs.

Feel free to call us at (617) 232-5470 if you have any questions or want to discuss specific article ideas.

Mail your manuscript to:

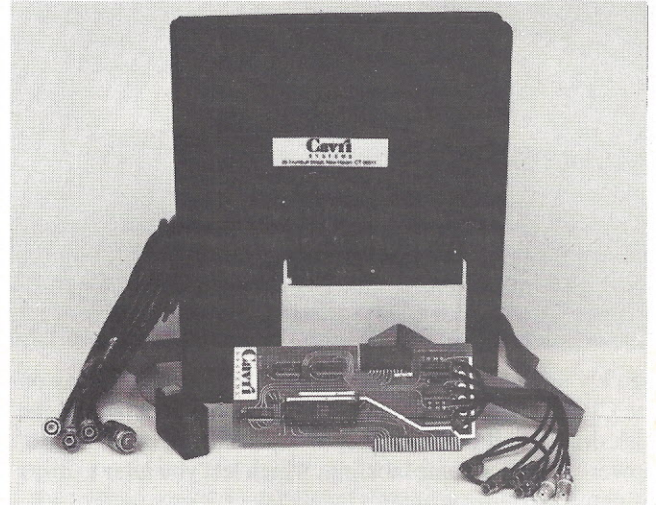
Don Wood, Managing Editor
Personal Computing
1050 Commonwealth Ave.
Boston, MA 02215

WHAT'S COMING UP

Computer-Videotape Integration

The Cavri III computer/video player integrator enables you, seated at the computer keyboard, to index and later access an extensive series of videotape frames or segments or to interact with videotaped materials.

In addition to integrating computer assisted instruction with videotape, the system is ideal for comprehensive storage and retrieval of text and audio-visual information. The system also allows you to control all remote functions of the VCR from the computer keyboard or from within a program.



Access time to a desired point on a videocassette during computer assisted instruction is kept to an absolute minimum, generally less than 5 seconds. The average time required to find randomly distributed segments of tape on a 30 minute video-cassette is about 45 seconds. Search accuracy is ± 7 frames or approximately within a quarter of a second, the company said.

The Cavri III System consists of an Apple I/O board, cables and connectors, system software in Applesoft Basic on disk, and a user's manual. It is available for VCR's that carry a control pulse or that interface with manufacturers' search units. Such units include the Sony Betamax and institutional quality Panasonic and JVC units. You can convert already made video-tapes, produce new tapes, or arrange to have Cavri produce materials for them.

Price is \$495. For further information contact Cavri Systems, Inc., 26 Trumbull St., New Haven, CT 06511; (203) 562-9873. *Circle No. 100*

Graphics in Dot Matrix Printer

Centronics Data Computer Corp. announced a new version of its Model 703 dot matrix printer for bar codes, building block codes and limited graphics applications under host computer control.

The new 703-G has all the standard features of a Model 703 printer as well as the graphics package. Under software control, the 703-G switches from the primary character set to the secondary set capable of doing special graphics applications.

WHAT'S COMING UP

The primary set contains 96 ASCII characters in a 9×9 dot matrix. In this set, the 703-G prints 150 characters per second at 10 characters per inch in a bidirectional, logic-seeking mode.

The secondary set has a 6×9 dot matrix character formation with no intercharacter gap on the line. In this set, printing is unidirectional, with paper motion in the forward direction only.

The 703-G has total downstream load capacity. When the printer starts up or resets, it automatically switches to the primary character set.

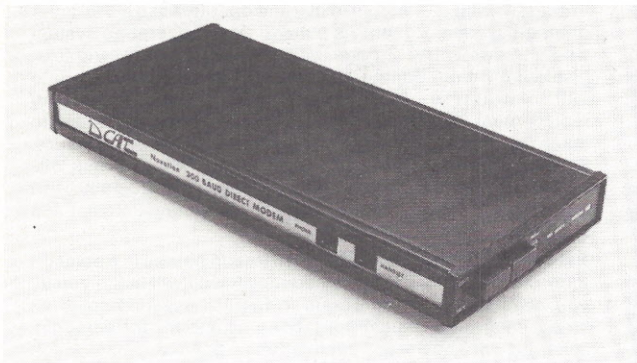
End user price for the new printer is \$3095. Availability is 45 days ARO. For more information contact Centronics Data Computer Corp., Hudson, NH 03051; (603) 883-0111. *Circle No. 103*

Direct Connect Modem for Small Computer Market

A low priced, highly versatile direct connect modem that can function on either a multi or single line phone is available from Novation, Inc.

FCC-approved for handset jack connection with any modular phone, the new answer/originate direct connect modem is part of the popular Cat Series introduced last year. Designed specifically for the personal and small computer market, the Bell 103 compatible unit is called the D-Cat. It works with a single line or 50-pin, six-line business phone.

The low profile modem offers full duplex capability and voice/data monitor up to 20dB performance improvement over acoustic. It also incorporates a hold function, privacy button and self-test feature.



Priced at \$199, the D-Cat uses a separate AC power supply that eliminates internal heat and voltage hazards. The unit has a mode switch to allow the user to monitor whether voice or data is being transmitted.

Available throughout the country from industrial distributors, hobby stores and retail electronic outlets, the D-Cat is designed to let businessmen and hobbyists maximize the potential of their computer or terminal by letting one unit talk to another, the company said. It allows an individual to work at home and talk by phone to their office computer. They can also allow you to gain access to data banks and swap personal programs with other computer people.

For more information contact Novation, 18664 Oxnard St., Tarzana, CA 91356. *Circle No. 106*



MICRO-SPEED TRS-80 SPEED UP MODIFICATION THE BEST ON THE MARKET! Simutek's Micro-Speed increases computer operating speed by 50%

- 1) Speeds up your TRS-80 from 1.77MZ to a hefty 2.66 MZ!
 - 2) Shuts down during disk or cassette I/O to end lost programs, then turns back on automatically when disk or cassette I/O is finished. (Provided, of course, it was on to begin with)
 - 3) Connects to keyboard L.E.D. and blinks when unit is operating. Stops blinking when turned off!
 - 4) Comes with illustrated instructions. (Some soldering required)
 - 5) Average person can install in 10-20 minutes!
 - 6) All work is done in hardware! Absolutely no software drivers needed!
 - 7) Operates with any TRS-80, (except Model II) works with TRSDOS, NEWDOS or any other operating system or software. Works with RS-232 and telephone modems!
 - 8) Comes completely assembled and ready to install. All wires are stripped, switch installed!
- There are no hidden extra costs to you!**
- 9) May be turned on or off at any time! Even during program execution!
 - 10) Money back guarantee!!

order #2000 Micro-Speed Mod.

29.95

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Phone orders welcome 24 hours! (602) 886-5880. Simutek offers a number of other fine products especially for TRS-80's! Send for "FREE" catalog. TRS-80 is a TM of Radio Shack. A Tandy Corp. Arizona residents add 4% sales tax

NO CHARGE FOR SHIPPING

CIRCLE 36

Science Fiction



Turn your daydreams and visions of the future into cash. We're looking for short (500 to 2000 words) science fiction stories dealing with the future of microcomputers - their possible uses and their roles in society and in people's lives. Stories must be original and not published elsewhere. Submit your typed, double-spaced manuscript to Personal Computing, 1050 Commonwealth Ave., Boston, MA 02215.

SYSTEMS

Fast-Track Model 675

Compucorp announced the Fast-Track Model 675 Information Processor as an addition to its 600 Series product line.

Through the use of state-of-the-art technology, the 675 provides you with more than 2.6 million characters of diskette storage in a compact desk-top configuration, the company said. Because of the 675's high speed 655,360 character, 5.25-inch disks, the two disk version was nicknamed Fast-Track and the four disk version is called the Fast-Track 2+2.

The 675 allows you to keep large data bases and program libraries on-line using very inexpensive removable storage media, the company said. In the word processing marketplace, stand-alone systems have very limited storage capacity that severely restricts the maximum length of documents and mailing lists which can be stored on them. In data processing applications, prior to availability of the 675, users were forced to change diskettes when going from one operation to another. The 675 changes all of this, Compucorp said.

The Compucorp 675 has a large 12-inch video display with a capacity of 20 lines, each with 80 oversized characters. In addition, the Compucorp 675 can be fitted on a plug-in basis

with a Compucorp Model 60 full-page video display. The Model 60 display has a 4,800 character capacity in an 80 × 60 format.

The 675 keyboard has 20 separate user programmable function keys which provide 60 separate functions. These function keys are invaluable in word processing and extremely useful in data processing applications, the company said. The Compucorp 675 also has a built-in asynchronous/synchronous EIA RS-232C communications interface.

A software library is available for the new 675. As an upward compatible member of the Compucorp 600 Series, all existing Compucorp word processing and data processing software also runs on it. This library contains the Compucorp Omega word processor which includes: paragraph and document assembly, forms creation and fill-in, block manipulation, print-while-editing, right justification, underlining, bolding, sub- and super-scripting, selective mailing list merging and so forth.

The Compucorp Model 675-2/20, the Fast-Track, consisting of an Information Processor with 64K memory, two built-in diskette drives with a total capacity of 1,310,720 characters, a built-in RS-232 interface, an 80 × 20 video display and a full keyboard sells for \$9150.

The Compucorp Model 675-4/20, the Fast-Track 2+2, consisting of all of the above, plus two more diskette drives (for a total of four), making the system storage capacity

**TRS-80
LEVEL II**
\$ **685.**

COMPLETE
SYSTEM

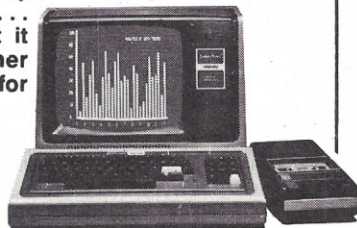
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CIRCLE 38

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LETTER MASTER - This is a lightning fast Word Processor which is simple to use and operates like a character oriented system. It features a menu driven operating system which allows entry, storage, editing, draft printing, and final justified printing. Editing includes line corrections (add up to 200 characters if you want), global search, string replacement, delete, add, and merge. Text floats as needed to make up lines of text. Print justified, unjustified, or a mixture. System prepares and prints form letters with its own 500 name/diskette full feature mailing list program. Applesoft II Disc. Item M-34, \$139.95. Processor without mailing list and form letter. Item M-33, \$69.95.

PROGRAMMER PLUS - A 16 lesson course in Applesoft II on two full disks or super-load tape which will teach you all you need to know to program in BASIC. Lessons cover all string, math and logical operations necessary for personal, scientific or business applications. Special units teach graphics and sound to add a little 'Apple Class' to your programs. Applesoft II, Item 35, Tape, \$24.95. Disc, \$34.95.

SCIENTIST - A powerful scientific data base and statistics program which will turn your Apple into a mathematical and graphics tool. It will do simple statistics or such complicated functions as Chi-Square, Normal, Student-t, and Poisson. With the Data Base element you can build your own analytical programs. Applesoft II Disc, \$89.95.

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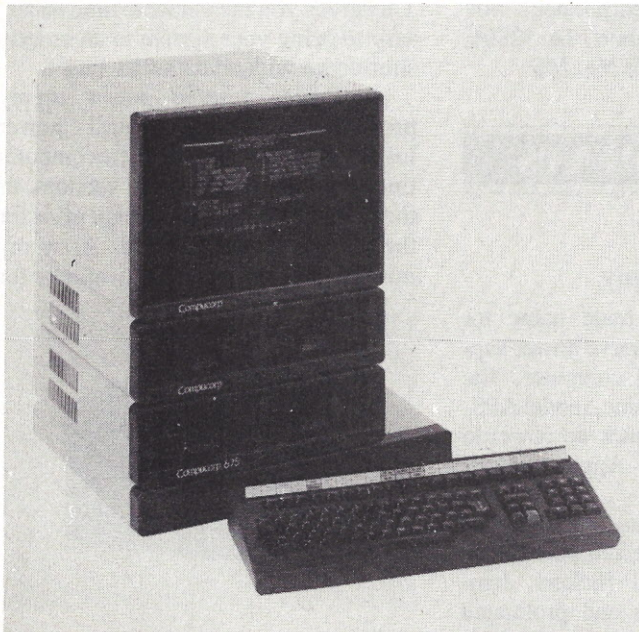
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Joshua Tree, California 92252

CIRCLE 60

WHAT'S COMING UP



2,621,440 characters, sells for \$11,500.

For more information contact Compucorp, 1910 South Bundy Dr., Los Angeles, CA 90025; (213) 820-2503.
Circle No. 166



TRS-80 COMPATIBLE DISK DRIVES AT GREAT DISCOUNTS!!



- These MPI drives are completely compatible with Radio Shack's and may be mixed and matched! (i.e. you may use Radio Shack drives and MPI's together with no problems! They are totally compatible with TRSDOS, NEWDOS, or any other TRS-80 software!)
- These MPI's have doors that close and keep dust out!
- These MPI's have auto diskette eject!
- These drives are one of the fastest on the market: 5 milliseconds versus Radio Shack's 40 milliseconds!
- These drives come complete with power supply and case and are ready to use immediately. They are compatible with Radio Shack's disk cable or you may purchase our cable.
- Dual drive is same as two drives but uses only one diskette! Save money on expensive diskettes! It may be used as drive 0 and 1, 1 and 2 or 2 and 3! This is a fantastic buy!
- **SAVE \$116 (Single drive) or \$451 (Dual drive)**
Over Radio Shack's single drive prices!

WE SHIP FAST! ORDER YOUR DRIVE TODAY!!!

Order #		
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8003	2 Drive Cable	24.95
8005	TRSDOS Manual and TRSDOS 2, 3	19.95
8006	NEWDOS+ (includes editor assembler that works with tape or disk, disassembler, superzap, basic variable reference, renumber, disk commands from basic, screen to printer command, and much more	99.95
8016	NEWDOS 80 and NEWDOS+ ("NEW" NEWDOS+ and more	149.95
8007	TRS-80 Disk and other mysteries by H.C. Pennington - gives explicit descriptions of TRSDOS, NEWDOS, SUPERZAP, DEBUG etc.	22.00
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8009	Single diskettes	2.99
8010	Disk holders (hold ten each)	2.99

Please add \$5.00 per drive for shipping & handling

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Phone orders accepted 24 hours (602) 886-5880. Foreign orders add \$20 postage and handling per drive. TRS-80 is a TM of Radio Shack. A Tandy Corp.
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CIRCLE 39

PRODUCTS FOR PEOPLE WHO CARE ABOUT THEIR TRS-80'S

NEWDOS-80 - By Apparat. Mix drives, chain commands, enhanced Disk BASIC, SUPERZAP in machine language, editor/assembler, printer spooling, etc. Excellent documentation.

..... #201007 (D) \$149.95

NEWDOS - This is TRSDOS with over 200 fixes and enhancements.

35 track #201002 (D) \$49.95

40 track #201001 (D) \$59.95

77 track #201005 (D) \$59.95

NEWDOS+ - Same as NEWDOS, but includes some indispensable utilities such as SUPERZAP, editor/assembler, etc.

35 track #201004 (D) \$99.95

40 track #201003 (D) \$110.

77 track #201006 (D) \$110.

BASIC COMPILER - By Microsoft. Develop your program in Disk BASIC, then compile it for up to 30 times the speed!

..... #201207 (D) \$195.

mmsFORTH - By Miller Microcomputer Services. Unconventional yet powerful, this language is recursive, interactive, and fast..

..... #206000 (D) \$79.95

AIDS-3 - By Meta Technologies. In our opinion the best DBMS for the money. In fact, we use it in our office. Suitable for personal as well as business uses. Performs operations on multiple conditions. Multi-key sort is machine-language assisted (it's fast). MAPS-3 (included) lets you generate reports in standard or user-defined formats.

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CALCS - Adds arithmetic manipulation to your reports.

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CORVUS TEN MEGABYTE DISK DRIVE - Imagine 95 40-track drives all on line at once! Max file seek time (searching all 95 directories) is six seconds. Includes TRSDOS-compatible DOS.

..... #105000 (call toll-free for price)

THE CONSTELLATION - By Corvus. Each Constellation allows up to 8 TRS-80's (up to 64 TRS-80's with 8 Constellations) to share up to four Corvus drives simultaneously. The standard Corvus DOS supports full communication between host processors.

..... #105001 (call toll-free for price)

MICROLINE-80 PRINTER - By Okidata. Designed especially for the TRS-80, this printer supports true TRS-80 graphics, upper/lower case, software-selectable 40/80/132 columns, pin-feed, roll paper, or typing paper. Relatively quiet and portable. #100002 \$699.
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CYLON RAIDER..... #200104 (C) \$7.95

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DUNJONQUEST FANTASIES from \$19.95

ANIMATED HANGMAN with sound. #200105 (C) \$9.95

Please add \$2.50 for shipping and handling.

COD add another \$1.25 plus 25% deposit, balance certified check or cash.



CIRCLE 40

Archives Business System

Designed as a complete stand-alone, desk-top system, the Archives Business system includes a Z80A CPU, 64K RAM, S-100 bus, dual 77-track disk drives with 744K bytes of storage, green phosphor CRT, a detachable microprocessor keyboard and CP/M operating system.

The CRT has a non-glare screen, 25 lines by 80 characters, 240 by 100 graphics format, inverse video, blink and underline in eight intensities. The Selectric style keyboard, totaling 104 keys, features a left-hand function keypad, righthand numeric keypad and 23 relegendable function keys.

The system supports WordStar word processing, the full line of Peachtree software packages, a Legal Billing System and Apartment Management Package. Microsoft Basic, Fortran and Cobol are available along with CBasic 2 and a Basic Compiler.

Price is \$4500. For more information

contact Archives Incorporated, 404 West 35th St., Davenport, IA 52806; (319) 386-7400. *Circle No. 160*

COMPLEMENTS

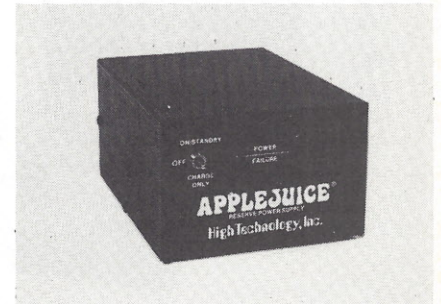
Reserve Power Supply

Applejuice is the trade name for High Technology's reserve power supplies for the Apple II computer. The newest addition to the line, model APS-3, supplies one-hour back-up power to the Apple II and to Apple-powered peripherals.

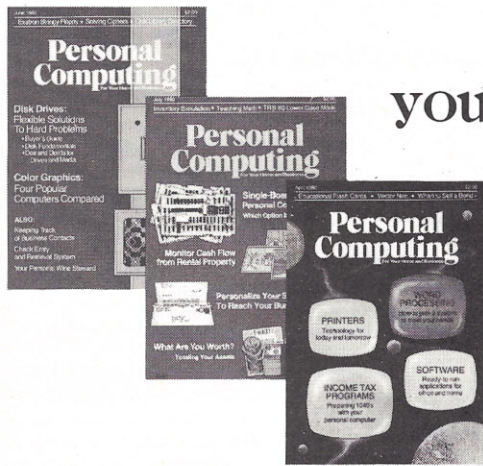
Applejuice can protect you against disaster during unexpected power failures, including small flickers, temporary power failures and prolonged electrical outages, the company said. During a power outage, Applejuice alerts you visually, audibly and electronically that there is a power failure.

This gives you the valuable time necessary to bring your system to an orderly shut-down with all data files intact.

Applejuice reserve power supply provides protection against power losses for the Apple microcomputer line, including European versions of the computer. Suggested retail price for the APS-3 model is \$295. A twenty minute unit the APS-2 is available for



\$249. For more information contact High Technology, Inc., P.O. Box 14665, Oklahoma City, OK 73113; (405)840-9900. *Circle No. 163*



If you're missing any of these you have gaps in your data bank.

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CIRCLE 41

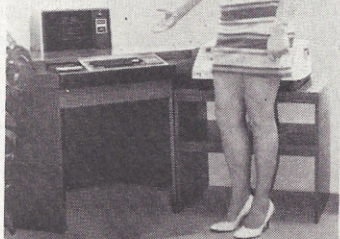
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Computer Consoles for \$129.95,
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Complete TRS-80 Business System,
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CIRCLE 42

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- * 8 in. drive & P.S./case \$790 with P.S./case for 3 drives \$950
- * 77 track (197,120 byte) 90 day warranty \$490
- * 4-drive cable \$28 ** 10 disks-5-in. @ \$25-8 in. @ \$39-hard case \$3 & \$5
- *** Base 2 printer-(60 line/min. 73,80,96,120 or 132 char. line
- Bi-direct dot matrix impact 96 char ASCII, 15 baud rates) \$499
- 2K buffer, graphics, & tractor option avail.***
- * Centronics 737 \$840+ + cable @ \$28
- * Harris selectric (word processing-typewriter & printer) \$790
- * Lower case for Centronics 779/Radio Shack line printer 1-easy install \$99.95
- * UPS (uninterruptible power supply) prevent power drop surge or out? From \$195
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- Applications interact & are complete & professional. Will run on other computer. This is a special introductory price.
- * Ask for free flyer with our low prices — dealer inquiries invited Mass. residents add 5% tax-F.O.B. Tewksbury — freight extra.
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CIRCLE 49

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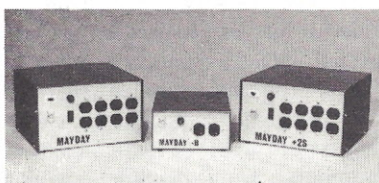
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CIRCLE 48

Computer Selection Handbook

Decision Resources announced the publication of the *Computer Selection Handbook*. Written specifically for small businesses and consultants, the handbook is a non-technical presentation of a straightforward method for selecting computer systems, the company said.

This book concentrates on the practical and business aspects of choosing the right computer for a small business. The emphasis is on methods of ensuring that the system selected will be a cost effective solution from a reliable vendor. By following the handbook's highly structured method, even a computer novice is able to make competent decisions, said the company.

Over 75% of the handbook consists of ready to use step-by-step procedures, checklists and fill-in-the-blank forms. Each step is supported by practical advice and many other useful discussions.

Computer Selection Handbook describes how to document small business computer needs, solicit and evaluate vendor proposals, make the selection decision, manage the installation and operation of the new system.

Price is \$35. For more information contact Decision Resources, 28203 Ridgefern Ct., Rancho Palos Verdes, CA 90274; (213) 377-3533.

Circle No. 107

A Self-Teaching Guide

Now available from Radio Shack is *TRS-80 Level II Basic*, a self-teaching guide for learning to program and use a Level II TRS-80 microcomputer system with no previous computer experience.

According to Radio Shack, no matter what your level of experience with computers, from beginners to more advanced hobbyist or professional, this 351-page step-by-step manual includes all the information needed to make a

computer work for you.

Written by Bob Albrecht, Don Inman and Ramon Zamora, each chapter of the self-teaching guide is composed of short, numbered sections called frames. Each frame presents a single idea or topic on the Basic language, the TRS-80 or a program that is being developed.

The authors believe that learning to program can be an enjoyable experience. They feel that computer terminology and concepts can be introduced within a framework of fun and exploration. Small games and recreations are sprinkled throughout the book. Application programs and the elements of developing simulation routines are also presented.

TRS-80 Level II Basic, a self-teaching guide, is available from participating Radio Shack stores, dealers and Computer Centers for \$9.95. For more information contact Radio Shack, 1300 One Tandy Center, Fort Worth, TX 76102; (817) 390-3272.

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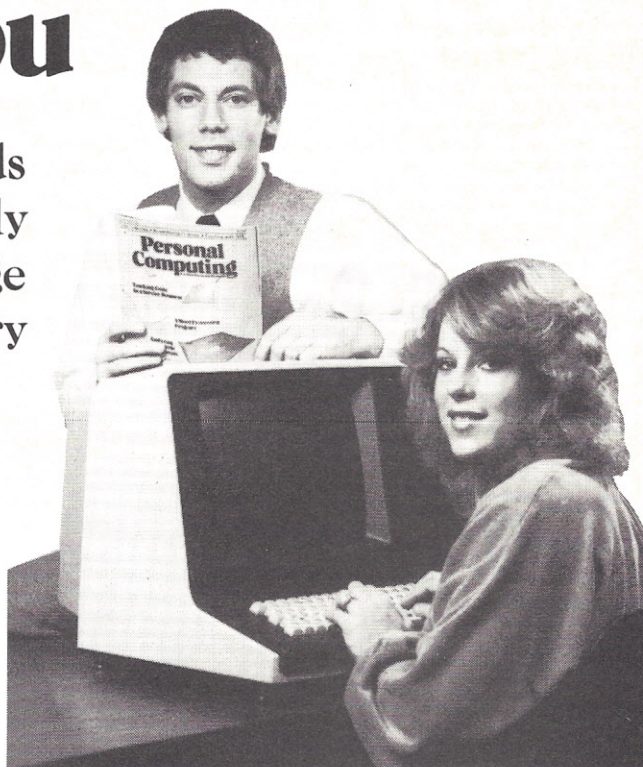
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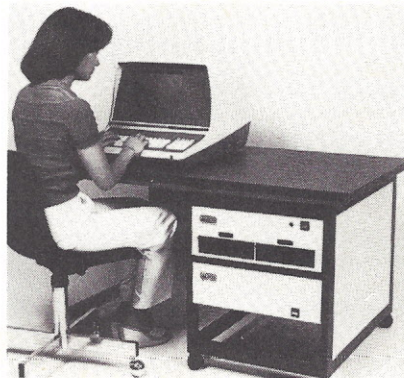
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and Digital Research, respectively.

CIRCLE 51

WHAT'S COMING UP

Adjustable Computer Desk

A computer desk, completely adjustable to contain any microcomputer and as many as two hard disks, has been designed by Western Micro Systems, a division of Western Microtechnology. Designated WMS-D100, this desk allows optimum use of floor space and is shipped in a compact configuration so delivery charges and storage requirements are reduced to a minimum, the company said.



The WMS-D100 features square legs, the characteristic which makes the adjustments and compactness possible. The legs are fitted with movable horizontal bars which can be raised or lowered to accommodate the height of any microcomputer and disks. The center leg can be moved sideways in either direction to allow for the width of any components. In addition, the component storage area can be located under either side of the desk, depending on your preference or floor plan limitations. In any configuration, the microcomputer and disks slide out for servicing. The result is a work station that can be rearranged or modified if equipment is changed. It can be rolled to another location, if necessary, since the unit is outfitted with casters.

The desk measures 48 inches by 32 inches and is 27 inches high. The desk top comes in a choice of two durable formica finishes, teak wood grain or cameo white.

Immediately available. WMS-D100 is shipped in a container measuring only 60" x 53" x 4", economical for transit and convenient for inventory storage. It is priced at \$425. For further information contact Western Micro Systems, 10040 Bubb Road, Cupertino, CA 95014; (408) 725-1660. Circle No. 104

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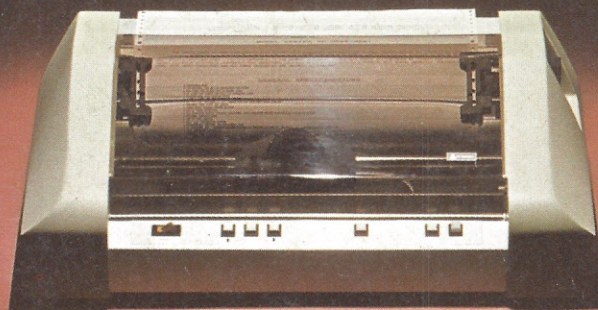
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CIRCLE 59



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